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London's Electricity Supply.

WE recently abstracted the report of the London County Council on electricity supply in the London and Home Counties Electricity District, and complimented the Council on the issue of these annual reports, which now comes to an end. No doubt the Joint Electricity Authority will take up the task, and keep us equally well informed as to the progress and development of the electricity supply industry in this area, which embraces one-fifth of the population of Great Britain.

By the two Acts of 1925 and the Electricity District Order of 1925 the supply of electricity was entrusted to the Joint Electricity Authority, which supervises 89 undertakings forming three groups, namely, a group of four companies; a group of ten companies (styled the London Power Company, which now owns or leases all the generating stations of the ten companies and supplies them with electricity in bulk); and the remainder of the companies and all the local authority undertakers, numbering 75 in all. The two company groups have a large measure of freedom to conduct their own affairs, but the undertakings in the third category come directly under the control of the J.E.A., which is preparing to erect a large power station at Chiswick for bulk supply.

In the hands of so many authorities, the supply has taken almost as many forms, varying from place to place in frequency and voltage, as well as in kind; worse still, perhaps, is the chaos of prices and tariffs which prevails. In view of the differences between the methods of charging, the only safe comparison must be based on the average revenue received per kilowatt-hour. For private lighting, power, and heat the average revenue of local authorities in the District in 1924-25 was 2.23d.; within the County the average was 2.12d., and outside its boundaries 2.40d. The figures for the companies were nearly a penny more—that is, 40 per cent. higher; their average revenue was 3.16d. (intra-London 3.14d., extra-London 3.24d.). Of the local authorities, the lowest was at Gravesend, 1.44d.; West Ham came next with 1.53d., then Woolwich, 1.57d., and Poplar and Erith, 1.62d. The highest in the County was Southwark, 3.57d., and Stoke Newington was also over 3d.; outside the County, Reigate, Epsom and

Maidenhead top the list with average receipts from 5.74 to 5.31d. Of the companies, West Kent has the best record with 1.8d., followed by Uxbridge with 1.96d.; and by the North Metropolitan with 2.28d.—all outside the County. The highest company revenue was also extra-London—9.43d. at Caterham (Urban Electric Supply)—with Edmundson's at Dorking a good second, 8.78d. Ascot District Gas and Electricity Co. and the Urban Co. at Weybridge and Walton scored 7.79d. and 7.70d. respectively. Within the County, Brompton and Kensington, Notting Hill and Chelsea—all pioneer companies—head the list with 4.91d. to 4.88d.; no other company undertaking makes a worse showing than 4d., or a better one than 2.42d. (South Metropolitan). The London Electric Supply Corporation's figures include the supply to the Southern Railway and are not comparable with the others.

Although additional returns for the company undertakings are given for 1925 in an appendix, they are not sufficiently complete to allow of a similar analysis, but West Kent again takes the honours with 1.35d., closely followed by Uxbridge and North Metropolitan as before.

The three London companies with capital expenditure over three millions sterling—the City of London, County of London, and the Metropolitan—were also the three with the largest total revenue, and the largest profits. The City Company, charging an average of 3.32d. per kWh for private supply, paid £223,402 interest and dividends, and transferred £166,704 to reserve; the County Company, receiving 3.48d., distributed £355,772 and put no less than £491,316 to reserve; the Metropolitan received 3.94d. per kWh, distributed £199,676, and put £206,250 to reserve. On the basis of "capital called up" in 1924, these companies respectively disposed of 17.15, 20.8, and 15 per cent. in the form of dividends, interest, and reserve funds. The larger the reserves, capitalised under the Acts of 1925, the worse for the consumers of the future; and those reserves have been provided by the consumers of the past.

Compared with the low prices charged by most of the local authority undertakers, the company figures make a bad showing; they illustrate the contrast between private profit and public service, and suggest that after all there was some justification for the claim that public-service monopolies should be in public hands. We hope that under the new *régime*, which is intended to ensure the supply of electricity at the cheapest possible rates, the spirit of service will prevail and that the public interest will be the ruling consideration.

The Salaries of Engineers.

THAT it is the hope of reward that sweetens labour is a principle which lies at the very foundation of public and private service, whether the desired reward be fame, fortune, or the consciousness of duty done. With the first and last of these considerations we are not here concerned, though both are powerful incentives to work and have exercised immense influence on the development of civilisation—we wish rather to comment on the financial aspect of the subject, in the light of the correspondence which has been in progress in our columns during the past two months.

The profession of engineering has an inherent fascination for a large proportion of our race, and electrical engineering in particular possesses attractions which have drawn into its ranks a greater number of recruits than is justified by its requirements; throughout the past 30 years the profession has been overmanned, and complaints have been uttered by those who felt that their merits had not received just recognition. Unfortunately it is only too true that the standard of remuneration of electrical engineers in general has been, and is, far below the scale obtaining in other professions which can be entered with less arduous and lengthy training and entail no greater responsibilities, and whilst we look forward hopefully to a bright future, it is impossible to ignore the existing situation.

Various proposals have been put forward with a view to finding a remedy. The efforts of the Electrical Power Engineers' Association have met with a considerable measure of success; not only have its members in electricity supply undertakings secured a recognised schedule of salaries, but also it has gained the respect and confidence of the employers' side of the industry, and has been able to improve the lot of its members in private employ. The Society of Technical Engineers, which is not in a position to adopt the methods of the E.P.E.A., has promoted a Bill for the Registration of Engineers, with a view apparently to restricting the area from which posts can be filled. The bogy of Socialism has been invoked to frighten employers, and the policy of educating employers and the public has been advocated. The Institution of Electrical Engineers has been repeatedly charged with indifference to the interests of its junior members, and urged to take official action in the matter; but this, we know, is impossible, as the Charter of the Institution specifically debars the Council from concerning itself with questions of wages and salaries, and, as the President pointed out at the annual general meeting last week, even the Appointments Register has to be conducted unofficially, quite independently, by a voluntary committee in order to comply with the law. It is useless, therefore, to appeal to the Institution as a body, but the fact does not absolve its members from a measure of responsibility with regard to their fellows, and we welcome the suggestion of Mr. E. T. Williams that the leaders of the profession should interest themselves in the question.

In this, as in many other social matters, education is the soundest means to secure reform. The first step is to bring it home to the public that engineers are not adequately rewarded for their labours; the next, to induce employers to recognise their responsibilities and to remove the reproach under which they lie.

The Central Scotland Scheme.

THE publication of the scheme which the Electricity Commissioners have forwarded to the Central Electricity Board, marks the commencement of the operations of that body, which came into office on the first of this month. An outline of the scheme is given on a later page, from which it will be seen that practically the whole of the industrial area of Scotland is embraced within its scope; the Board could hardly wish for a more favourable field in which to put its principles to the test, as the district includes collieries, engineering and shipbuilding, and manufacturing industries in abundance, whilst it is compact, so that long-distance transmission of electricity will not be required, and densely populated centres are numerous, so that the main lines can be tapped with profit. During the next seven years the Board will spend over five millions sterling, of which the greater part will be devoted to the standardisation of frequency, and the owners of selected stations will spend £850,000—a total of six millions, as against about 3.3 millions that would have had to be spent on the basis of individual development in the absence of the scheme; and in ten years' time the area will have an abundant supply of electricity from eight capital stations interconnected by ring mains. Let us hope that the supply will also be cheap; the Commissioners estimate that in the first four years—*i.e.*, 1930-34—there will be a saving of £894,000. On the other hand, at the end of that period the capital charges on the transmission system, up to then suspended, will be brought into account and the Commissioners anticipate a deficit in 1933-34 and later years, which is to be met by a uniform average charge of 0.0475d. per kWh supplied by the Board from the commencement.

A mass of estimates and data has been published by the Board, which will be studied with interest by all concerned with electricity supply.

Publicity for Supply Undertakings.

Simple Language and Plain Statements Essential.

By EDWARD E. HAMAR (Shropshire, Worcestershire and Staffordshire Electric Power Co.)

AS one interested in the publicity side of a supply undertaking which distributes power in large industrial and rural areas, I feel that I can offer a few suggestions as to what is a good business-getting style of advertising.

Engineers are too much inclined to take things for granted, that is, they expect the consumer or prospective consumer to know almost as much about the business as they do themselves. The public are certainly becoming more educated in the uses, but not the technicalities, of electricity; therefore only the uses, with the cost of operation, should be spoken of.

It is astonishing how many people who would welcome a supply do not even know how to obtain it. In order to appeal to the public, all advertising literature, whether explaining a particular appliance or the cost of operation, must be in very simple language. The leaflet or booklet may be a work of art in appearance, but if in its pages there appear numerous calculations with such words as volts, amperes, watts, &c., in most instances it will not be understood, and instead of the leaflet being put on one side for reading at leisure, it will be committed to the fire or waste-paper basket.

The periodical circulation of leaflets of seasonal character, commencing with one dealing with "Our Service and How to Obtain It," leads to a marked influx of new and additional business. This initial pamphlet should commence with a simple and brief outline of the generating side of the business, followed by distribution and a simple explanation of how the costs of an electricity supply undertaking are made up, and concluding with detailed information of what to do to obtain a supply and a few of the most important uses to which electricity can be applied. The circulation of such a pamphlet should be followed by a personal call from a canvasser, who should be the type of man who has been educated to talk in a language which is intelligible to the lay mind, that is, simple and non-technical. Seasonal literature, which can be enclosed with the quarterly accounts, should take the form of attractive leaflets giving illustrations of the different electrical appliances, with an explanation and the cost of operation.

It is very pleasing to note that contributions to the non-technical Press generally on electrical service are improving, but in reading between the lines of many of the articles there is still a certain lack of confidence in electrical appliances. This lack of confidence can be largely accounted for by the fact that it is only during recent years that perfection has been attained in certain apparatus. Electricity has developed so rapidly within a short period that many are inclined to think of appliances as they were some few years ago, and not as they are to-day. Quite recently I read an article, excellent in many respects, on electric cooking, and some of the smaller electric domestic labour-saving appliances. Unfortunately, however, it mentioned the great care and attention that was called for, in addition to which a large amount of stress was laid on the fragility of these appliances. I agree that electrical appliances have to be handled with a certain degree of care, but no more care is necessary than would be called for if other methods offered the same convenience and were of an equally portable character.

There is also the question of cost of operation which, in most instances, is dealt with on the lines that electricity is exceedingly expensive if particular attention is not given to control of heat and the like, and that electrical appliances should be handled by the housewife and not the maid, otherwise a very heavy account may be expected at the end of the quarter. Now, such conditions apply to other methods, such as coal, oil or gas, but there is always a very pronounced emphasis upon the cost of electricity. This is in all probability due to the fact that the advance in the knowledge of the writers has not kept pace with the progress of electrical apparatus. Such statements, which are made with no intended malice towards our business, are very harmful to both the manufacturer and supply undertaking. I feel that each of us in our own publicity can do much towards regaining the confidence of the public, for with the perfection of electrical appliances we are now in a position, based on practical experience, to give true facts regarding both reliability and cost of operation.

My comments so far have chiefly dealt with prospective business. Now for a few words regarding the existing consumer, for the loading-up of existing services is as essential as new business. I find from experience that the forerunner of any campaign for obtaining additional loading of service connections should be in the form of a booklet, which could be entitled "Our Service, and What it Will Do." The booklet should be illustrated, with a concise explanation of the appliances, how to use them, and the cost of operation. This can be followed up a few days later by the call of a canvasser, and in many instances it will be found that the booklet has already obtained the desired interest in some appliance or other, and all that remains to complete a sale, or the hire of apparatus, is a few further details. There always appears to be a certain degree of objection to canvassers, for many are inclined to think of a canvasser as one who only considers commission, with no regard to the truth of his statements. Suitable publicity preceding the call will, however, make all the difference in the attitude of the prospective purchaser, and also make it easier for the canvasser.

A further tried suggestion is a house-to-house inventory of all electrical appliances in use or discarded. It is surprising how much apparatus has been put on one side owing to small defects, and apart from this, the information obtained will be found exceedingly useful for other purposes. Here we come to the point as to whether a reasonable allowance could not be made for the old discarded appliances towards replacing them with more modern types. This, in my opinion, is a business proposition, for apart from the resultant increased revenue by again having the apparatus in commission, the confidence of the consumer in electrical appliances is retained. It is really nothing more than a service to which the consumer is entitled and if we wish to see the hoped-for development in the domestic side of our business, service has got to be given.

The Electrical Development Association is now issuing some very attractive publicity matter both in the form of leaflets and posters, and I should like to see a larger display of the latter on the hoardings of towns and villages throughout the country. Good posters leave that lasting impression which in publicity is the goal for which we strive.

Internally-Heated Furnaces.

A recent development in the total enclosure of the heating elements of resistance furnaces by means of specially shaped bricks which are built up to form the furnace lining, providing adequate support and uniform heating.

OF the varied problems encountered by the designer of large internally-heated electric furnaces, that of ascertaining the most effective method of installing the heating elements is by no means the easiest to solve. Numerous forms of construction have been tried both in this country and abroad, differing in type no less than in the difficulties presented by their employment: for instance, the use of knobs of porcelain, or other material, fixed to the walls and roof of the furnace chamber, on which the nickel-chrome wire or strip heating element was wound, led to early failures, the failure of the knobs being in some instances due to heat and in others to mechanical damage; cast nickel-chrome grids have also been employed, but this form of heating element does not satisfactorily permit of floor heating and possesses other disadvantages.

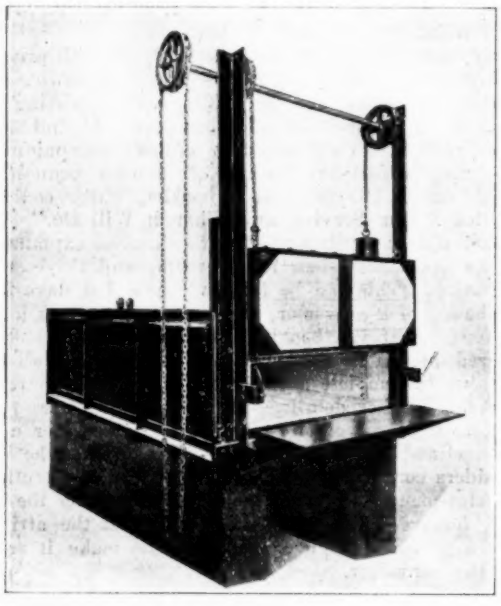


Fig. 2.—A Muffle Furnace, 36 kW at 440 Volts.

The designing of large types of electric furnaces to meet the requirements of manufacturers so far as uniform heating is concerned and, at the same time, guard the heaters and their supports from mechanical damage has been no easy matter. It must be borne in mind that furnaces of large capacity must be of rugged construction to withstand rough usage and the very heavy abrasive wear occasioned by the continuous introduction of heavy articles and their removal from the chamber; this fact led to the decision that heating units in such furnaces should be entirely enclosed, and it was also considered advisable that the bricks forming the lining, and certain other parts of the furnace, should be free to expand and contract during the period when they were being heated and while they were cooling. As the result of the above-stated conclusions, the form

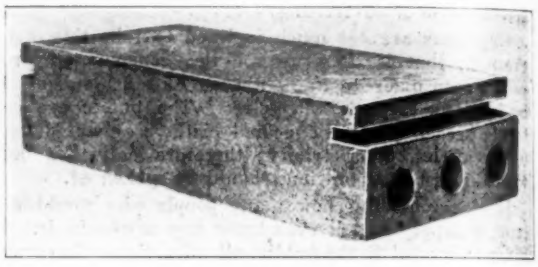


Fig. 1.—Furnace Lining Brick.

of brick construction depicted by the accompanying illustrations has been designed by Automatic and Electric Furnaces, Ltd. The type of brick used in Wild-Barfield internally-heated furnaces is, as shown in fig. 1, pierced with longitudinal holes, so that when the bricks are built up to form a chamber the holes in each adjacent brick coincide to form tunnels through which special spiral heating elements, or rods, can be freely drawn, thus allowing uniform heating conditions throughout the entire chamber; the wire spirals or rods, being entirely enclosed in separate tunnels, are prevented from coming into contact with any material being heated in the furnace, and an arrangement of bus-bars at the far end allows of the linking-up of the various units to meet the requirements of one-, two-, or three-phase supply. Fig. 2 shows a rectangular muffle furnace having a heating chamber 56 in. by 28 in. by 8 in., the input being 36 kW at a pressure of 440 volts on a three-phase supply circuit.

One great advantage of this type of electric furnace construction is the ease with which the heating units can be divided to suit various conditions of supply. In this particular case there are 18 spiralled coils to each phase, the arrangement being six coils in series and three in parallel per phase. The maximum working temperature in the chamber is 1,000 deg. C., and the control is automatically accomplished by means of

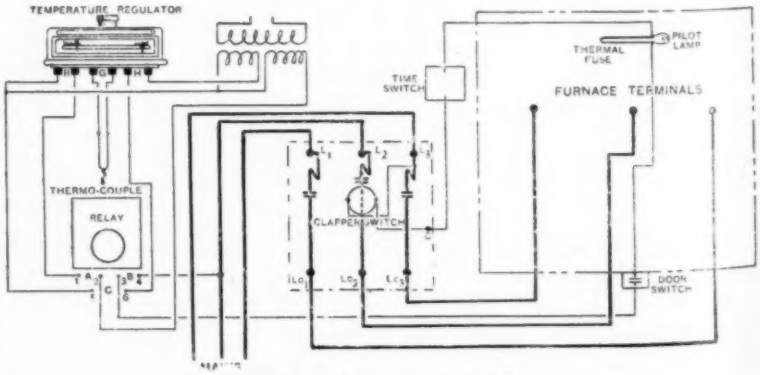


Fig. 3.—Automatic Temperature Control Diagram.

a combined Cambridge regulator and clapper switch. Fig. 3 shows the circuits, and it will be noted that in

the local energising circuit is a patented thermal fuse, which enters the heating chamber and is connected in series with the relay, time switch, door switch, and the energising coil of the clapper switch; it will be seen that the complete circuit may be broken at four different points. The thermal fuse is shunted by a red pilot lamp, so that, in the event of overheating, the red lamp will light immediately the fuse melts. The door switch is automatic in action, *i.e.*, when the door of the furnace is open, the main heating circuit is broken, so that there can be no possibility of shock to the operator; when the door is closed, the circuit is once more made. The time switch is (1) for the purpose of early morning switching on before the works open, so that the furnace is hot when the operatives arrive, and (2) for night operation when the furnace is timed to come into operation after the works are closed, the heating charge being controlled by the automatic temperature control mechanism.

Fig. 4 shows two large Wild-Barfield hot plates, each measuring 6 ft. square, to operate on a 200-volt, 2-phase supply circuit; they have been constructed for a special purpose, uniform heating and simplicity of temperature control being essential; the loading of each plate is 25 kilowatts, and they operate at a temperature of 780 deg. C. It will be noticed that the bricks in which the heating spirals are laid, unlike the furnace bricks shown in fig. 1, have open grooves, so that the heating elements in this case are actually exposed. Many internally-heated electric furnaces are in operation both in this country and abroad, their use not being confined to the heat-treatment of steel, but being equally important in the annealing of non-ferrous metals, glass,

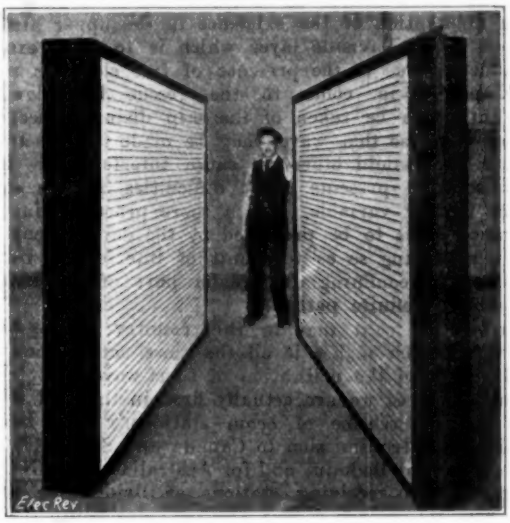


Fig. 4.—Two 25-kW Hot-plates, 200 Volts.

&c. In addition, special furnaces of this construction are designed to suit various industrial requirements.

Wireless Telegraph Communication.

A review of the present position of maritime safety services, commercial communication, and point-to-point telegraphy in view of the proposed modified requirements and regulations to be discussed at the International Conference to be held in the United States next Autumn.

By Lieut.-Col. CHETWODE CRAWLEY, M.I.E.E.

(*Continued from page* 676.)

(III) Point-to-Point Wireless Services.

THERE were practically no commercial point-to-point wireless services in operation when the last International Conference was held in 1912, so that the whole field of point-to-point communication will be virgin soil for the International Conference to be held this autumn at Washington.

It is likely that spark waves will be prohibited for international point-to-point communications, owing to their causing such wide bands of interference, but in any case there are now no important point-to-point stations using spark transmission. Rules to regulate the allowable widths of wave bands will no doubt be formulated, and the question whether wireless telephone services should be confined to certain definite wave bands will be considered.

Wave-lengths.—Attempts were made just after the war to formulate some broad principles for regulating the wave-lengths to be used for long range communications. One attractive suggestion was to divide the world into geographical zones so that the receiving stations in any given zone would all be receiving from distant stations waves which, though close together, would not cause mutual interference as the signals would all be of much about the same strength and could be easily sorted out, whereas the strong signals transmitted from stations in that zone, though not differing much in wavelength from one another, would be well separated in wavelength from the signals being received from the distant stations and could thus be eliminated in the receiving circuits. No definite scheme however was adopted, and the network of international wireless communications which has since grown up has been regulated, successfully on the whole, by a policy of compromise and common sense. It is unlikely now that any attempt will be made to allocate wavelengths on geographical or national bases.

There are only about 100 long waves available for the use of high-power stations, so that it would be extremely difficult to arrange for any great expansion of long-wave working, but fortunately the newly discovered possibility of using short waves for long distances has eased the situation.

Theoretically there are some 3,500 waves under 100 metres available for long-range work, but it must be remembered that the advent of wireless telephony on short waves for long ranges will before long absorb a great number of waves which would otherwise be available for telegraphic purposes. There are, too, the difficulties that all short waves are not equally suitable for all distances, that short waves which are suitable for certain communications at one period of the day or night are not necessarily suitable at another, and that waves which are suitable at one season of the year may not be so suitable at another. The theoretical

number of available waves, therefore, may be much reduced in practice.

History however will no doubt be repeated, and new avenues for advance will be opened up as in the past. The assumption of the existence in the upper atmosphere of a Heaviside layer which is to some extent conductive due to the presence of free electrons may perhaps, again come to the rescue by allowing advantage to be taken of the skip distance effect of short waves so that waves may be made to skip areas where they would otherwise cause interference. But this solution presents great difficulties as the skip effect is very variable, and a more practical line of advance seems to be presented by the development of beam signalling so as to admit of interference being reduced by confining the greater part of the transmission to definite paths.

It is often said that in this country we are slow starters, which makes it all the more satisfactory to realise that in the utilisation of short-wave beams for great distances we are actually first in the field with our Empire scheme of beam stations. The beam stations for transmission to Canada and South Africa are situated at Bodmin, and for Australia and India at Grimsby, with receiving stations at Bridgwater and Skegness respectively. The wireless valve transmitters are operated by high-speed apparatus in the G.P.O., London, and the wireless signals received are relayed from the receiving stations to the recording machines which are placed alongside the keying apparatus. The Canadian and Australian services are in satisfactory operation, and the others will be ready shortly. These stations, which were erected by the Marconi Company, are to be operated by the Post Office, and in addition the Marconi Company now has a beam service in operation to South America.

In the Empire at the beginning of the year we had working or under construction eight long-range short-wave stations, including the beams, as compared with two in the United States, one in Italy, one in Germany, and one in the Argentine, and we had nine smaller ones, compared with nineteen throughout the rest of the world.

The advantages of using short waves, compared with long waves, are that for long ranges the possible number of stations in operation is enormously increased; as explained above, the power required for operation is much less than that required for long waves, thus greatly reducing capital cost and running expenses; interference from atmospherics is much less, and the signalling speeds obtainable are much greater. The only disadvantage is that, at present, communication by short waves is not nearly so reliable as by long waves due to fading and similar phenomena which are so far little understood and for which remedies have still to be found.

As regards high-power stations using long waves, we cannot boast of numbers as we have only 5 in the whole Empire, compared with 15 in the United States, 9 in France, and 18 in the rest of the world. But on the other hand, it is satisfactory to note that, with the co-operation of the United States, we have inaugurated the first long-range telephone service, the London-New York circuit, and that we have at Rugby the most powerful all-round station in the world.

Operation.—Three systems are used for long-wave transmission over great distances, valves, arcs, and alternators, and we have an example of each in this country.

The Post Office station at Rugby uses valve transmission on an 18,740-metre wave. It broadcasts Government communiqués to ships and stations all over the world free of charge, transmits commercial traffic to ships in any part of the world at an inclusive charge of 1s. 6d. a word, and, in conjunction with a receiving station, is used simultaneously for the transatlantic telephone service on a wave between 5,000 and 6,000 metres from 1.30 p.m. to 7 p.m. daily except Sundays at a charge of from £15 to £17 8s. for three minutes' conversation. For telegraphy, the Rugby station is operated, as are all the Post Office point-to-point stations, over land lines from the G.P.O., London, and for wireless telephony it is operated by the sender's voice over a trunk line from London, the received messages from New York being relayed to London from the wireless receiving station at Wroughton. A new receiving station for this service is being completed at Cupar. A medium-power long-wave set and a short-wave valve set are also being installed at the Rugby station for point-to-point services.

The Post Office arc station at Oxford uses waves of 12,350 metres and 8,750 metres, and transmits commercial traffic to Cairo and Press messages to Halifax. There is, too, a short-wave set at the Oxford station, which is used to supplement the long-wave transmission.

The similar Post Office arc station at Cairo, which will shortly be turned over to the Marconi Company, transmits on an 11,000-metre wave to Oxford, Germany, France, Italy, and Basra, and broadcasts meteorological messages on behalf of the Egyptian Government.

The Marconi Company operates a high-power alternator station at Carnarvon for the transmission of traffic and Press messages to America on waves of 14,200 metres and 9,400 metres. A high-power valve transmitter is also installed at this station as an alternative.

The Post Office operates medium-power long-wave valve stations at Northolt and Stonehaven for transmission to Italy, Cezcho-Slovakia, Hungary, Russia, Poland, Esthonia, and Danzig, and, in case of cable interruptions, to Germany, Norway and Iceland.

All messages received are relayed to the G.P.O., London, from the Post Office receiving station at St. Albans, with the exception of messages from the beam stations, which relay from their special receiving stations.

The Marconi Company operates a group of medium-power long-wave valve stations at Ongar for transmission to France, Spain, Portugal, Sweden, Austria, Jugo-Slavia, Switzerland, and Russia. The company is also free to open services with various other European countries and with countries outside Europe, but all stations for communication with the Empire will be operated by the Post Office.

All the Marconi Company's transmitters are operated from its office at Radio House in London, to which the received messages are relayed from its wireless receiving station at Brentwood.

The Marconi Company also conducts a telephotographic service which is available for the transmission of pictures, printed matter, &c., between London and New York. There is no television service yet in commercial operation.

As a rule the sending apparatus at point-to-point stations is operated by Wheatstone transmitters, and the speed of signalling in the case of the long-wave stations is from 50 to 100 words a minute, and from 100 to 200 words a minute in the case of the short-wave stations. The received messages are normally recorded in Morse code by Wheatstone or undulator instruments, or as printed letters by Creed apparatus. The latter arrangement saves writing up the messages, but is not so suitable as the former ones when receiving conditions are unsatisfactory.

The rates for radiotelegrams are as a rule the same as for cables and land lines, and where no route is specified by the sender the Post Office selects the route according to circumstances at the time of transmission. When the rates differ, the wireless rates are the lower, as in the case of the Australian beam service and the service to Egypt. The rates for the beam services to South Africa and India have not yet been announced.

The broadcasting services can hardly be considered as commercial point-to-point services, but it is interesting to note the number of stations now in operation. In North America there are about 800 (700 in the United States), in Europe 170, in South America 40, in Oceania 30, in Asia 20, in Africa 10, making a total of about 1,070 stations throughout the world.

The Measurement of Sheath Losses in Cables.

The accurate determination of sheath losses in single-core cables is of great importance in connection with the transmission of energy at very high pressures, but has presented great difficulties. The author describes a simple, quick, and accurate bridge method of measurement.

By R. A. BROCKBANK, B.Sc.

CONSIDERABLE attention has been directed recently by cable manufacturers to the determination of sheath losses in cables, in view of the possibility of employing single-core armoured cables for very-high-voltage transmission. The subject has formed the basis of several theoretical studies, but several assumptions have to be made about which the various authors are not in entire agreement, so that it becomes necessary to correlate any differences between experimental data and calculated results in order that the losses may be predetermined with fair accuracy from the physical characteristics of any cable.

Up to the present the published results appear to have been obtained almost exclusively by the use of the electromagnetic wattmeter. This instrument, whilst offering apparently a simple solution to the problem, suffers, even in skilled hands, from many disadvantages, the most serious being:—

(i). Corrections due to the phase angles of the two coils.

(ii). Very low sensitivity with small currents and relatively short lengths.

(iii). Necessity for an absolutely constant voltage supply; the loss varies as the square of the voltage.

(iv). Necessary arrangements for giving various current ranges.

(v). Accurate calibration of voltmeters and ammeters in conjunction with their leads.

(vi). Interpolated resistance readings between each wattmeter reading due to the change in resistance caused by the large currents.

The following method of measuring sheath losses was evolved in the E.H.T. Research Laboratories of Messrs. Standard Telephones and Cables, Ltd., for a special line of research requiring the highest sensitivity, where the electromagnetic wattmeter had to be abandoned owing to its insensitivity and inaccuracy.

The schematic diagram is shown in fig. 1 and consists essentially of a superimposed a.c. and d.c. bridge. The cable (z_1) is connected in series with a standard resistance R_3 of the order of 0.01 ohm. The other side of the bridge consists of two 10,000-ohm decade resistance boxes in series, R_4 being shunted with a 2-mfd. variable mica condenser (C_4). By means of the switch S_1 a d.c. galvanometer or a.c. vibration galvanometer can be thrown across the junction joints of the arms R_1 R_3 and R_2 R_4. The bridge is supplied by a low-voltage loading transformer, and provision is made for balancing the bridge on d.c. by switches S_2 S_3, which admit a 4-volt battery into the circuit. S_3 is a heavy-current-carrying-capacity switch (500 amps). S_4 opens the a.c. supply. The current through the cable is determined by measuring the voltage drop across R_3.

Consider the case when the bridge is in balance on alternating current. Then the impedance of arm $(4) = R_4/(1 + jw\ C_4 R_4)$.

Thus in the balance condition $z_1 \times R_4/(1 + jw\ C_4 R_4) = R_2 R_3$, whence $z_1 = R_2 R_3/R_4 + j\ (w\ C_4 R_2 R_3)$
and the phase angle of the cable
$z_1 = \tan^{-1} w\ C_4 R_2 R_3 \times R_4/R_2 R_3 = \tan^{-1} w\ C_4 R_4$.

Therefore $R_2 R_3/R_4$ will be the equivalent resistance of the cable which multiplied by (current)^2 will give the cable loss.

The bridge is balanced by keeping R_3 and R_4 constant and varying R_2 and C_4; the absolute value of C_4 is not required, unless a knowledge of the phase angle or inductance of the cable is desired.

The d.c. copper resistance of the cable is obtained by switching in the d.c. galvanometer and including the battery in place of the alternating current. R_2 is adjusted for balance.

The sequence of readings to obtain the various losses is as follows:—

(i) Put the bridge on d.c. and adjust R_2 to a value R_o for balance.

(ii) Put the bridge on a.c. with the lead open-circuited. Adjust R_2 and C_4 for balance. Let the value of R_2 be R_a.

(iii) Bridge on a.c. with lead bonded. Adjust R_2 and C_4 for balance. Let this value of R_2 be R_b.

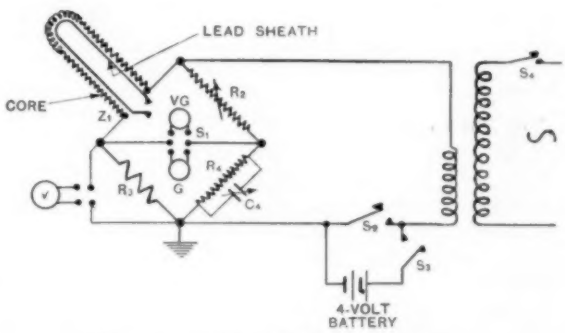


Fig. 1.—Arrangement of Bridge Testing Apparatus.

From these values of R_o, R_a, and R_b—

100 $(R_a - R_o)/R_o$ = loss due to eddy currents, skin effect, &c., as a percentage of the copper loss.

100 $(R_b - R_a)/R_o$ = loss due to circulating sheath currents as a percentage of the copper loss.

and 100 $(R_b - R_o)/R_o$ = total sheath loss as a percentage of the copper loss.

Also $I^2 R_o$ = "dead" copper loss (on d.c.).

$I^2 (R_a - R_o)$ = eddy and skin resistance loss.

$I^2 (R_b - R_a)$ = circulating bonded lead loss.

$I^2 (R_b - R_o)$ = total bonded loss.

A typical result on a short length of 66,000-volt, single-core, lead-covered cable with 6 inches between axes gave the following results:—

$R_3 = 0.01$ ohm; $R_2 = 4{,}000$ ohms; $R_o = 1{,}980$ ohms; $R_a = 2{,}029$ ohms; $R_b = 2{,}537$ ohms;

therefore loss due to eddy-current and skin effect as a percentage of the copper loss $= 100\ (R_4 - R_0)/R_0 = 2.47$ per cent.

and circulating bonded loss as a percentage of the copper loss $= 100\ (R_b - R_a)/R_0 = 25.7$ per cent.

Therefore total sheath loss $= 2.47 + 25.7 = 28.17$ per cent.

The a.c. and d.c. galvanometers had sensitivities of 100 and 50 mm/microamp. respectively.

A check test on the circulating bonded loss from a knowledge of the lead open-circuit volts and lead and copper resistances gave the following result:—

Core current, 50 amps.; core resistance, 0.004951 ohm.

Lead voltage (open circuit), 0.290 volt; lead resistance, 0.02450 ohm.

Lead inductance (calculated), 20.5×10^{-6} henries.

Therefore, sheath loss $= 0.29^2 \times 0.0245/[0.0245^2 + (314 \times 20.5 \times 10^{-6})^2] = 3.205$ watts;

and copper loss $= 50^2 \times 0.004951 = 12.38$ watts.

Hence ratio sheath loss/copper loss $= 3.205/12.38 = 0.259 = 25.9$ per cent., which is in very good agreement with the measured value of 25.7 per cent.

The advantages which are claimed for this method are:—

(1) *Simplicity and Ease of Control.*—The method is a null method and only requires the adjustment of a resistance and a capacity; the value of the latter need not be known. No readings are taken from deflectional instruments.

(2) *Time of Reading.*—The three readings take from 3 to 5 minutes.

(3) *Accuracy.*—The accuracy depends solely on the accuracy of the decade box R_3, which has a value of 4,000 ohms, and only requires calibration to the nearest ohm to indicate a change in R_4 of the order of 2.10^{-4} ohms.

(4) *Sensitivity.*—The sensitivity is extremely high, and measurements can be made with currents as low as 5 amps. on a few yards of cable if the ratio arms R_3 and R_4 are reduced in value. The balance point is extremely sharp.

(5) *Wave Form.*—As the vibration galvanometer is tuned to the fundamental, only the loss due to a pure sine wave is measured.

(6) *Range.*—Measurements can be taken from 5 amps. upwards without any alteration to the circuit. The only limit is the ultimate carrying capacity of R_2.

Measurements on lead-covered cables do not require to be taken with the operating value of the core current, as the ratio of the sheath to copper losses is independent of the current. In the case of armoured cables, however, the loss must be measured separately for each working current, as the loss is a function of the permeability of the armour, which varies with the magnetising force.

Due primarily to the sensitivity and accuracy which this bridge method offers for measuring the losses on very short samples and small currents (for lead-covered cables), a large number of experimental data have been accumulated which have been correlated with theoretical calculations to a high degree of accuracy.

Ascertainment of "Kilowatt Maximum Demand."

A criticism of the method of obtaining the kilowatt maximum demand defined in the Electricity (Supply) Act, 1926.

By FREDK. W. PURSE, M.I.E.E., M.I.Mech.E., Chief Engineer, West Ham Electricity Department.

WITH the passing of the Electricity (Supply) Act, 1926, the question is brought into prominence of ascertaining the "kilowatt maximum demand" on which the charges for supply are to be based. It will be interesting to quote the exact words in the Act (Section 52 (3) b) and [Seventh Schedule]:—

"For the purposes of this (sub-Section) [provision], the (number of kilowatts of) maximum demand (for) [in respect of] any month shall be deemed to be twice the largest number of units of electricity supplied (to the undertakers) [from the generating station] during any consecutive thirty minutes in that month: Provided that if the number of kilowatts of maximum demand so ascertained [for any particular month] shall be less than the number of kilowatts of maximum demand (in) [for] any previous month of the same year of account (payment shall be made on) the higher numbers [shall be taken as the maximum demand for the first mentioned month]."

This is the first time that public legislation has actually set out how the kW m.d. shall be ascertained; the system prescribed singularly differs from other methods, and it is difficult to understand the basis of its foundation.

Theoretically speaking, the fixed charge per kW should produce exactly the total of the fixed costs when applied to the respective maximum demands, if these have been correctly ascertained.

In considering this matter it will be useful to enumerate the generally accepted methods of ascertaining the kW m.d.:—

(1) The highest recorded in any year of account to be charged throughout the whole year.

(2) The highest recorded each quarter to be charged for that quarter.

(3) The highest recorded in each month to be charged for that month.

Note.—To avoid severe fluctuations in monthly accounts this method can be applied by charging each month the average of the previous twelve months.

(4) The new method in the Electricity Act, which can be called the "Government method."

It will be obvious that to raise a total "fixed charge" of, say, £100,000, the amount to be levied per kW m.d. will be a varying figure under the methods enumerated above.

It will be lowest under (1), highest under (3), some intermediate figure under (2), and indefinite under (4), depending upon the month in which the m.d. occurs.

What concerns supply engineers, however, is which of the methods, when applied, whilst producing the same result to the undertaking, will be most equitable to all the consumers.

A hypothetical example will be of some assistance, and for simplicity's sake it has been assumed that the

undertaking is supplying two consumers only, as follows:—

	A. Registered. kW.	B. Registered. kW.	Undertaking. Registered. kW.
April	40,000	25,000	65,000
May	40,000	15,000	55,000
June	35,000	10,000	45,000
July	30,000	10,000	40,000
August	30,000	15,000	45,000
September	35,000	15,000	50,000
October	45,000	20,000	65,000
November	50,000	30,000	80,000
December	55,000	45,000	100,000
January	55,000	45,000	100,000
February	50,000	40,000	90,000
March	45,000	35,000	80,000
12 months total	510,000	305,000	815,000
Ave. monthly kW	42,500	25,416	67,916

Now assume that the undertaking's fixed costs amount to £407,500. This sum must be obtained in one way or another through the kW m.d., and represents (*a*) £4,075 per kW reckoned on the highest m.d. on the undertaking, or (*b*) 10s. per kW m.d. per month on the actual monthly demand (NOTE.—The same charge of 10s. per month would apply if the average of the twelve months were taken, as mentioned above), or (*c*) £1.2936 per quarter per kW m.d. if charged on the highest m.d. in the quarter.

To clearly see the effect of the method inserted in the Electricity Act, it will be necessary to repeat the above table, but modified to show the figures on which the charges will be made:—

	A. Charged under Government method. kW.	B. Government method. kW.	Undertaking. Registered (as in previous table). kW.
April	40 000	25,000	65.000
May	40,000	25.000	55.000
June	40,000	25.000	45,000
July	40,000	25.000	40,000
August	40,000	25,000	45,000
September	40.000	25,000	50,000
October	45,000	25.000	65,000
November	50,000	30.000	80.000
December	55,000	45 000	100,000
January	55,000	45,000	100,000
February	55,000	45.000	90,000
March	55,000	45,000	80,000
12 months' total	555.000	385.000	815,000
	940,000 kW.		

In this case, to produce the same total fixed cost as before, the charge to A and B will, in accordance with the Act, have to be 8.67 shillings per kW m.d. per month.

If the total costs to each consumer A and B are worked out for the respective methods, they will be found as follows:—

	A	B	Total.
(1) Annual max. demand ...	£224,125	£183,375	£407.500
(2) Quarterly max. demand ...	239,400	168,100	407,500
(3) Actual monthly demand ...	255,000	152,500	407,500
(4) Government method ...	240,598	166,902	407,500

It is obvious that the four methods, giving such varying results, cannot all be right; possibly not one is correct, but one may be the nearest approximation that is obtainable.

Which one is it?

Perhaps if another set of illustrations be worked out with somewhat different characteristics it may throw some more light on the subject.

In the following example the maximum load of each consumer is the same, but one occurs in the summer and the other in the winter, and the total maximum load on the station is the same as in the previous example, *viz.*, 100,000 kW, so that the total fixed costs of £407,500 remain the same.

	A. Registered. Kilowatts.	B. Registered. Kilowatts.	Undertaking. Registered. Kilowatts.	Govt. method. A.	Govt. method. B.
April ...	50,000	45,000	95,000	50,000	45,000
May ...	60,000	30,000	90,000	60,000	45,000
June ...	75,000	12,000	87,000	75,000	45,000
July ...	80,000	12,000	92,000	80,000	45,000
August ...	80,000	15,000	95,000	80,000	45,000
September ...	60,000	30,000	90,000	80,000	45,000
October ...	50,000	50,000	100,000	80,000	50,000
November ...	30,000	65,000	95,000	80,000	65,000
December ...	20,000	80,000	100,000	80,000	80,000
January ...	20,000	75,000	95,000	80,000	80,000
February ...	30,000	70,000	100,000	80,000	80,000
March ...	40,000	60,000	100,000	80,000	80,000
	595,000	544,000	1,139,000	905,000	705,000
				1,610,000	

The respective charges would be:—

(1) Annual maximum demand, £2.547 per kW.

(2) Quarterly maximum demand, 17.34 shillings per kW per quarter.

(3) Actual monthly demand, 7.155 shillings per kW per month.

(4) Government method, 5.06 shillings per kW per month.

The total costs apportioned would be as follows:—

	A.	B.	Total.
(1) Annual max. demand ...	£203,750	£203,750	£407,500
(2) Quarterly max. demand...	212,500	195,000	407,500
(3) Actual monthly demand...	212,874	194,626	407,500
(4) Government method ...	229,060	178,440	407,500

Some curious results emerge from these examples.

In the first set of conditions the quarterly m.d. and the Government method give approximately the same results, but under the second set of conditions the quarterly and monthly m.d.'s give almost identical results.

If the second set of conditions are examined, it will be noticed that consumer A represents a class of load eagerly sought after, *viz.*, a high summer peak and a low winter peak, such as would obtain with a supply to an ice factory.

Yet it will be seen that (assuming the year of account commences in April) this consumer pays the highest amount under the Government method, and in no case less than the other consumer whose m.d. is identical and occurs at the usual time in December.

Generally, the consumer with such a special summer load is quoted a lower rate than other "peak-load" consumers because he is being supplied from plant that would be otherwise standing idle, but this is no logical reason, since this consumer, if he were using his own plant, would have to carry his fixed charges whilst his plant was standing idle in the winter.

The fixed charge is, of course, made on the consumers' kWh m.d., and it would be obviously unfair to base it only on the consumers' demands which coincided with the m.d. on the station, especially under the second set of conditions given above.

The lower rate quoted for what is called a non-peak load should not obtain because of the so-called non-peak; it is a lower rate because all the rates move in sympathy, and this is seen above where the rate under the first set of conditions is £4.075 per kW of annual m.d., compared with £2.547 in the second set of conditions.

It would appear generally that method 1 would give the nearest approach to equality as between consumer and consumer without introducing complicated records and calculations.

If the consumer desires to pay his account according to his monthly or quarterly m.d., it should be at a rate which produced the same result as by applying the approximate rate to the annual maximum demand.

Thus in the first set of conditions consumer A's quota should be £224.125 paid on his annual m.d.

On his quarterly m.d. the charge to produce this sum would be £1.211 per kW, as compared with £1.2936.

On his monthly m.d. the charge would be 8.8 shillings per month, as compared with 10 shillings per month.

Naturally, consumer B's rate on such a quarterly or monthly basis would not be the same, but they would both pay at the same rate per kW of annual maximum demand, *viz.*, £4.075 per kW.

Certain factors may come in to cause variations, such as the total amount of load, whether high voltage or low voltage, power factor, and others which need not be enumerated, but there is not the same difficulty in making adjustments for these.

The fundamental basis to be determined is the correct allocation of the fixed costs as between consumer and consumer according to their loads, and maybe each of the methods enumerated above departs sufficiently from a correct allocation to make them all equally unsound.

The matter has received considerable attention in the United States, and even now there does not appear to be a generally accepted method of ascertainment and application.

In view of the prominent place that two-part tariffs will occupy, both as regards the number of undertakings that will be supplied in bulk by the Central Electricity Board and the number of consumers, domestic in particular, that will be supplied by the respective undertakings, the author suggests that the matter should be specially investigated by some authority or committee with a view to a definite and agreed basis being formulated that could be universally applied by all suppliers of electricity.

Central Scotland Electricity Scheme, 1927.

Prepared by the Electricity Commissioners in pursuance of Section 4 of the Electricity (Supply) Act, 1926, and published by the Central Electricity Board.

THE Electricity Commissioners have prepared the above-named scheme and "transmitted" it to the Central Electricity Board. It deals with an area of 4,980 square miles, as outlined on the accompanying map, including roughly, the whole of the industrial, shipbuilding, and coal-field areas of Scotland, and extending from Montrose and Brechin, in the county of Forfar, to the southern boundary of the county of Ayr.

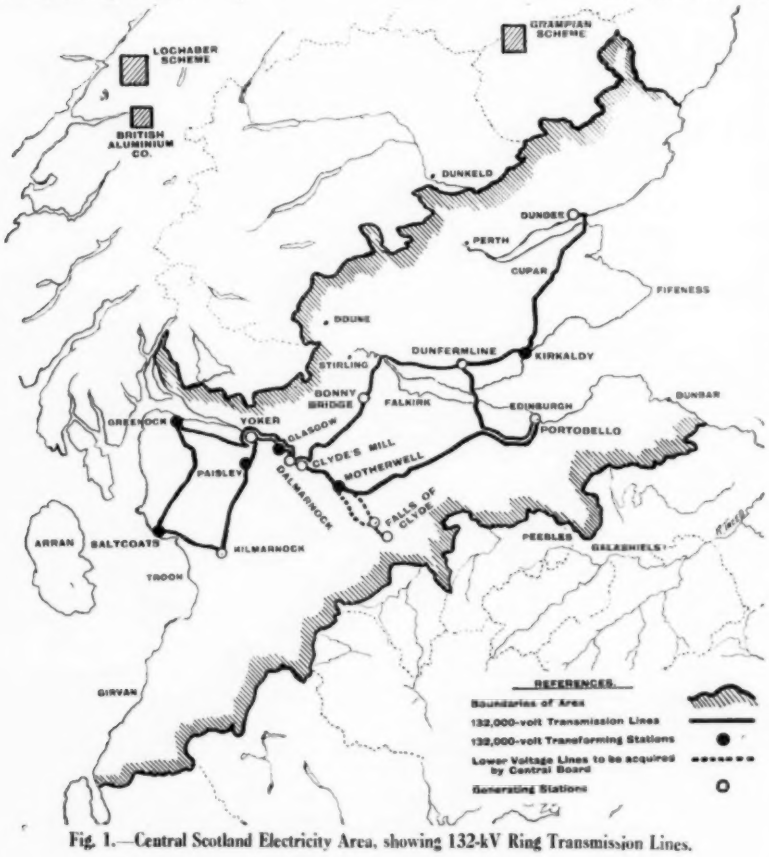


Fig. 1.—Central Scotland Electricity Area, showing 132-kV Ring Transmission Lines.

At present there are 42 authorised undertakers in the area, owning between them 36 generating stations; it is proposed that the following 10 stations shall be selected and operated for the Board: Clyde's Mill and Yoker (Clyde Valley Electrical Power Co.); Dalmarnock (Glasgow Corporation); Portobello (Edinburgh Corporation); the Falls of Clyde (Stonebyres and Corra Linn) hydro-electric stations (Lanarkshire Hydro-Electric Power Co.); Bonnybridge (Scottish Central Electric Power Co.); Carolina Port (Dundee Corporation); Dunfermline (Fife Electric Power Co.); and Kilmarnock (Ayrshire Electricity Board); the four last-named will be required for limited periods only, and will later be dispensed with.

The extension of the following four stations is contemplated: (i) Clyde's Mill; an addition of 50,000 kW for operation by the winter of 1935-36, and a further addition of 50,000 kW for operation by the winter of 1936-37. (ii) Dalmarnock; an addition of 25,000 kW for operation by the winter of 1932-33, and a further 25,000 kW for operation by the winter of 1935-36. (iii) Portobello; an addition of 50,000 kW for operation by the winter of 1937-38. (iv) Yoker; an addition of 25,000 kW for operation by the winter of 1933-34, and a further 50,000 kW for operation by the winter of 1934-35; all to be 3-phase, 50-cycle plant.

The erection of two new 3-phase, 50-cycle capital generating stations, the first section of each to be of not less than 100,000 kW, is contemplated for operation by the winter of 1937-38; the commencement of station B in the east is subject to arrangements which may be made by the Central Board for obtaining electricity from other sources, such as the hydro-electric works authorised by the Grampian Electricity Supply Acts, 1922 and 1924.

It is estimated that by the end of the financial year 1933-34 the capital expended under the scheme will be as follows:—

(*a*) By the Central Board on transmission lines and transforming stations (including capitalised interest), £2,204,034, and on the standardisation of frequency £2,921,250.

(*b*) By the owners of selected stations on extensions (56,250 kW), £850,000.

On the basis of individual development in the absence of the scheme, authorised undertakers would have to provide for the installation in existing or new stations of 250,000 kW (inclusive of the above-mentioned 56,250 kW) to meet the load in that year, representing a capital expenditure of £3,312,320.

Broadly speaking, the scheme looks forward to the area being supplied in ten years' time by 8 capital stations (*i.e.*, 6 existing and 2 new), which will be interconnected by a series of high-pressure main transmission lines. The transmission system is designed to form a series of ring mains, so that there will be alternative routes to points of supply, and consequently greater security against breakdown. Incidentally, the interconnection will release for revenue-earning purposes about 88,000 kW of plant now kept as spare, and representing about £1,670,000 of capital.

The following main transmission lines are to be constructed by the Board for interconnection of selected stations with one another and with the systems of authorised undertakers: Three-phase overhead lines, designed for operation at 132,000 volts between phases and capable in each case of transmitting not less than 50,000 kW, from—(1) Clyde's Mill to Yoker *via* Dalmarnock and Port Dundas (date of completion, October, 1928). (2) Portobello to Dalmarnock *via* Dunfermline and Bonnybridge (date of completion, October, 1929). (3) Portobello to Clyde's Mill *via* Motherwell (date of completion, October, 1930). (4) Dalmarnock to Greenock direct (date of completion, October, 1931). (5) Dunfermline to Dundee *via* Kirkcaldy (date of completion, October, 1931). (6) Yoker to Greenock *via* Paisley, Kilmarnock and Saltcoats (date of completion, October, 1932).

In connection with the aforesaid overhead lines, transforming stations are to be provided at the undermentioned places, each to aggregate a rating in kVA of not less than that specified unless otherwise determined:—

	KVA.		KVA.
Bonnybridge ...	40,000	Kirkcaldy	20,000
Clyde's Mill ...	90,000	Motherwell	30,000
Dalmarnock ...	150,000	Paisley	90,000
Dundee	30,000	Port Dundas ...	90,000
Dunfermline ...	30,000	Portobello	90,000
Greenock	40,000	Saltcoats	20,000
Kilmarnock ...	30,000	Yoker	60,000

Transmission lines are to be acquired by the Board as follows:—Two 3-phase, 11,000-volt, single-circuit main transmission lines from Corra Linn to Stonebyres; two 3-phase, 11,000-volt, double-circuit main transmission lines from Stonebyres to Motherwell.

The Electricity Commissioners have also forwarded with the scheme a series of supplementary particulars in which they have outlined a plan of working the selected stations, with the necessary estimates. These suggestions are, of course, tentative, since the practical working of the scheme, including the fixing of tariffs, is the responsibility of the Board; but, taking the figures as they stand, it is of interest to note that the Commissioners contemplate that the Board should be able to commence supplying in August, 1929, and estimate that in the four years 1930-34 there will be a gross saving to the undertakers in the area of no less than £894,000, or an average of nearly one-quarter of a million per annum. It must be remembered that these savings apply only to a single area in the early days of the Board's work, and should improve steadily even in this area as the use of electricity grows. While the estimates of the Commissioners show that there will be an immediate and substantial saving, the full benefits to the consumer in the shape of reduced prices can only be realised as the progressive economies take effect. The capital already spent on the 30 less efficient stations now existing, but which the scheme contemplates will be closed down, must be paid off, or discharged, and it is only when this has been done that the full advantage of the new system will accrue.

The scheme involves a large measure of standardisation of frequency: no fewer than 11 undertakings and 5 generating stations will have to be altered from 25 to 50 cycles. The Commissioners, in a prefatory memorandum, state that as comprehensive regional schemes cannot be carried out with full economy in areas where there are differing systems without first effecting standardisation, they have advisedly given early attention to industrial areas in which a non-standard frequency has been widely developed. The object is to avoid future expenses on non-standard plant, and to hasten the time when manufacturers as well as undertakers (and consequently consumers) will obtain the benefits arising out of the production of electrical machinery for one uniform frequency only.

Copies of the scheme and supplementary particulars may be purchased for 1s. and 2s. 6d., respectively, from H.M. Stationery Office. Authorised undertakers and other persons may make representations thereon by registered letter addressed to the Board not later than June 14th, 1927. After considering such representations, the Central Board will adopt the scheme, either with or without modification, as need be, and will put the scheme into operation.

The Commissioners have in preparation other schemes dealing with Central England; Yorkshire, Lancashire and Cumberland; South-East England, including London and the Home Counties; South-West England and South Wales, and thereafter for the remaining areas as may be expedient.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The Union Cable Co.

With reference to the paragraph published on page 716 of our last issue under this title we are glad to be able to publish a statement based upon information received from the Union Cable Co. The report was based upon a longer one which appeared in another form in the *Frankfurter Zeitung*, and which we are assured is totally incorrect. There have been no negotiations whatsoever between the Union Cable Co. of Dagenham and the German company mentioned, or with any other German interests. The Union Co. has never been approached either directly or indirectly, and we are informed that the board would not on any account entertain any suggestion of such a nature.

Electric Power in Industry.

Further important industries are dealt with in Preliminary Report No. 10 upon the 1924 Census of Production (*Board of Trade Journal*, May 5th). The first is the jute, hemp and linen group, which is stated to have had 6,076 kW of electric generating plant in 1907, 12,964 kW in 1912, and 12,573 kW in 1924. The trades had 23,132 h.p. of electric motors in 1924, power for 12,368 h.p. of which was purchased. The electrical generating plant possessed by the rope, twine and net trades rose from 575 kW in 1907 to 3,205 kW in 1924. Motors aggregating 14,281 h.p. were installed in 1924, and power for 10,470 h.p. of these was purchased. The canvas goods and sack trades had 92 kW of generating plant in 1907 and 614 kW in 1924. The motors aggregated 5,279 h.p. (power for 4,833 h.p. purchased). The linoleum and oilcloth trades reported 3,564 kW of plant in 1907, 6,129 kW in 1912, and 10,364 kW in 1924. The motor power was 15,831 h.p., and power for only 539 h.p. was purchased.

The Department of Overseas Trade.

The Times says that a new movement to save the Department of Overseas Trade from the fate which threatens it has been inaugurated by a number of Conservative members. They are anxious to obtain facilities for a discussion on the following motion:—"That whereas the Department of Overseas Trade has proved its efficiency and value to the satisfaction of trade and industry generally, at whose urgent request it was established, and whereas by its constitution it has been able to co-ordinate and energise the commercial work of the Consular services, Trade Commissions, and other commercial representations throughout the Empire as well as in foreign countries in a manner which past experience has shown to be impossible under the control of any one of the senior Departments, and whereas any apparent small saving in expense of discontinuing it as a separate Department would prove a false economy, as it would be far more than counterbalanced by the loss direct and indirect to trade as well as in the efficiency of the transferred services, this House is of the opinion that the continued existence of the Department of Overseas Trade as a separate Department is essential to the development of trade and industry throughout the whole Empire."

Wages in the Engineering Industry.

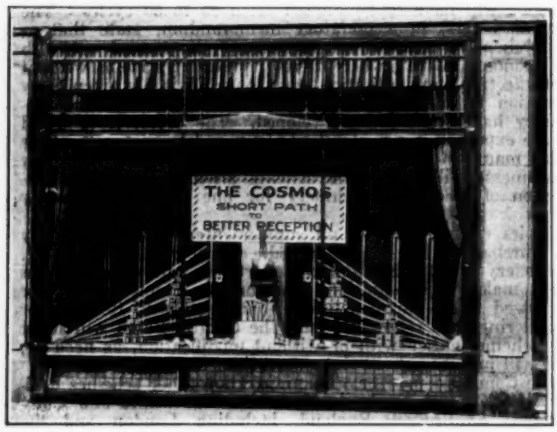
As we have already reported, the considered reply of the Engineering Employers' Federation to the engineering trade unions' request for an offer of increased wages will be given at a joint conference on May 19th. In the interval, a meeting of the London District Joint Committee has been held, and a resolution has been passed calling upon the trade union representatives to demand a definite reply from the employers, and, failing the receipt of this, to empower the London Committee to take action to enforce its claim.

The 1927 Radio Exhibition.

We have received from the Radio Manufacturers' Association a mass of details relating to the National Radio Exhibition which is to be held at Olympia from September 24th to October 1st. This includes a form of application and agreement for prospective exhibitors, full regulations, drawings of typical stands, particulars of charges, and plans of the ground floor and gallery, with the costs and sizes of each stand shown. Positions will be allotted by ballot among firms whose applications are received by June 14th. The primary ballot will be for exhibitors at the 1926 exhibition, whether members of the R.M.A. or not.

A "Cosmos" Valve Display.

One of the windows of the premises of Metro-Vick Supplies, Ltd., Charing Cross Road, W.C.2, is illustrated in the accompanying picture. It advertises in a simple but effective way "Cosmos Shortpath" radio valves.



A "Cosmos" Valve Window.

Bankruptcy Proceedings.

John Atkins, trading as Atkins & Co., 59, Church Street, Tewkesbury, The Electricity Works, Northleach, late High Street, Winchcombe, Gloucestershire, electrical engineer.—The receiving order in this matter was made on April 21st on debtor's own petition. The statement of affairs shows liabilities of £803, against assets of £535, leaving a deficiency of £268. Debtor attributes his present position to the failure of an undertaking for the supply of electricity at Winchcombe, and pressure by creditors. In May, 1920, he commenced business in partnership with another at Windsor as electrical engineers. He provided a capital of £270 in stock and cash, and his partner agreed to provide a capital of £200, but only paid a sum of £45. During the partnership they carried out contracts with two companies for the installation of plant and supply of electricity for two towns in Wales. In addition they did the principal portion of the wiring for the consumers in respect of these undertakings. The partnership was dissolved, and in November, 1924, debtor continued trading on his own account. In 1924 he commenced a contract to install the plant and provide the electricity supply for a Northleach company. This transaction was a success, and he also did the wiring for the consumers. Debtor states that his wife advanced him various sums amounting to £696, and that the amount still owing is £153. He also states that in January, 1925, he commenced negotiations for the supply of electricity to Winchcombe, near Cheltenham, and in October, 1925, a company was incorporated to carry out the undertaking. He was later advised to abandon the scheme, as the necessary permit would only be granted to a large supply undertaking. In the meantime the debtor had incurred considerable expense in the promotion and formation of the company, and a signatory who had made advances was claiming the money from him personally. The debtor had also done work to the value of £163 in wiring and fitting for electric light, which was not payable until the electricity supply had been taken to Winchcombe, and the consumers' premises were connected.

W. J. Broome, trading as the Stockport Electrical Company, Garrick Place, Daw Bank, Stockport, electrical engineer.—The public examination of this debtor was held on May 3rd at the Court House, Stockport. The statement of affairs showed gross liabilities of £582, and a deficiency of £486. Debtor stated that he commenced business on his own account in January, 1925, with £15 capital. For a time he was successful, but later it appeared that he overbought about £250 worth of stock. One of his creditors, who had obtained a judgment order against him for goods supplied, secured a committal order. Debtor said that he advertised the business extensively, but had not been able to maintain it long enough to secure the benefits of the advertising. He admitted that he had under-estimated for jobs and then had to sublet them at a larger figure. After further questions the examination was closed.

Jacob Segal, gas and electrical accessories merchant, 2, Vine Street, Tooley Street, S.E.—This debtor failed in September, 1926, with total liabilities £3,344, of which £2,044 is expected to rank, and assets "nil." According to Mr. D. Williams, Official Receiver, the debtor attributes his insolvency entirely to his liability (£2,044) to the petitioning creditor in respect of three guarantees for which he received no consideration. The debtor attended last week before Mr. Registrar Mellor at the London Bankruptcy Court, and was allowed to pass his public examination.

L. Wintle, late of 27, Stafford Street, Market Drayton, electrical engineer.—This debtor attended for his public examination at Crewe Bankruptcy Court on April 29th. The statement of affairs showed gross liabilities of £237, and assets of £1. He said that in October, 1922, his brother commenced business as an electrician, but in January of the following year left to become an employé of an electricity company. On the invitation of his brother he took over the management of the business, which was not successful. The examination was closed.

L. Bell, Joseph Street, Leeds Road, Bradford, trading as Charles Bell, mechanical and electrical engineer.—The first meeting of creditors was held on May 6th at the Official Receiver's office, Bradford. The statement of affairs showed gross liabilities of £3,132, of which £3,067 was expected to rank, against assets of £1,707. The creditors resolved to appoint Mr. John Lund, I.A., as trustee, while a committee of inspection was also nominated.

A. Smethurst (A. Smethurst & Co.), electrical engineer, 62, Bernard Street, Southampton.—First meeting held May 12th, at the Official Receiver's office, Midland Bank Chambers, High Street, Southampton; public examination, May 18th, at the Court House, Southampton.

J. Turner, electrician, 62, Blackburn Road, Great Harwood, Lancaster.—First meeting, May 16th, at the Official Receiver's offices, 11, Winckley Square, Preston. Public examination, June 15th, at the Court House, Blackburn.

A. P. Pacifico (A. Pacy) (partner in the firm of Comton Wireless Manufacturing Co.), 41, Carlton Mansions, N.16.—Discharge subject to consenting to judgment for £5 being entered against him (£5 paid to the trustee in lieu of entering up judgment).

E. G. Batt, electrical engineer, 20, Iverna Gardens, and Magnet House, Kingsway, W.C.—Application for discharge to be heard June 1st at Carey Street, W.C.

C. J. Brookes, wireless dealer, 6, Cross Street, Wigston Magna, Leicester.—Trustee, Mr. E. Barlow, Official Receiver, 1, Berridge Street, Leicester, released April 25th.

A. L. Weekes, electrical engineer, 13, Crescent Road, Luton.—Receiving order made April 28th, on creditor's petition.

Company Liquidations.

Electricity Finance & Distribution Corporation, Ltd.—A petition for the winding up of this company has been presented to the High Court by F. E. Passmore, of Hollyhurst, Wroxham, T. Passmore, of 83, Cannon Street, E.C., and R. P. Higgs, of Crown Works, South Lambeth Road, S.E., executors of J. E. Passmore, deceased, late of Hollyhurst, Wroxham, and will be heard in London on May 17th.

B.D.S. Wireless, Ltd.—A meeting of members is called for June 8th, at 26, Corporation Street, Birmingham, to hear an account of the winding up from the liquidators, Messrs. H. S. Willmott and F. E. Bendall.

Southern Counties Electric Light & Power Supply, Ltd.—First meetings of creditors and contributories, May 12th, at Carey Street, W.C.

Dissolutions of Partnership.

T. W. Bruce & Smith, plumbers, electrical and heating engineers, 23, Strathmartine Road, Dundee.—Mr. T. W. Bruce and Mr. W. S. Smith have dissolved partnership. Mr. Smith will attend to debts and continue the business under the same style at the old address.

South Coast Electric Welding Co., electric welders, 44, Shelbourne Road, Bournemouth.—Messrs. A. E. Gibbs, T. G. Leach, F. W. Wild and F. C. Duell have dissolved partnership.

Ball & Marchant and the Reliance Garage, motor and electrical engineers and garage proprietors, 8, Warwick Street, and South Street, Tarring, Worthing.—Mr. R. Ball and Mr. C. H. Marchant have dissolved partnership. Mr. Ball will attend to debts and continue the business.

Canning's New Works.

Messrs. W. Canning & Co., Ltd., of Birmingham, have placed a contract for their new engineering works to be built in Constitution Hill, in close proximity to their principal premises. The work will be completed in about 15 months' time.

Chinese Dry Battery Organisation.

The *Chinese Economic Bulletin* reports that a Guild of Dry Battery Factories has been formed in Shanghai with a view to the elimination of the "cut-throat" competition which is prevalent. The members number 35, and the first action of the Guild has been to increase prices.

New Catalogues and Lists.

MESSRS. MAVOR & COULSON, LTD., 47, Broad Street, Mile End, Glasgow.—A May calendar-blotter advertising the "Samson" coal cutter.

BROOK MOTORS, LTD., Empress Works, Huddersfield.—Sheets 161 and 162, announcing the prices of "L" type squirrel-cage and slip-ring motors.

X-RAYS, LTD., 11, Torrington Place, W.C.1.—A profusely illustrated brochure describing the company's X-ray equipment. Fully priced.

MESSRS. L. McMICHAEL, LTD., Wexham Road, Slough, Bucks.—A circular letter dealing with the company's radio apparatus and a blotter and leaflet (priced) advertising the "Dimic Three" receiving set.

SADIA, LTD., 30, Ely Place, E.C.1.—List H, containing illustrated details of "Sadia" water heaters and auxiliary equipment, with prices and particulars of running costs. Also a folder upon the same subject.

HOPKINSON INDUCTION MOTORS, Willesden Lane, North Acton, W.3.—May stock list of a.c. motors.

MESSRS. YOUNG & WILDSMITH, LTD., 20, Bloomsbury Street, W.C.1.—A net trade price list of electrical materials, accessories, and appliances.

MESSRS. GARNETT, WHITELEY & Co., LTD., Lotus Works, Broadgreen Road, Liverpool.—A series of leaflets dealing with "Lotus" radio components, including a remote-control system. Illustrated and priced.

THE RELAY AUTOMATIC TELEPHONE CO., LTD., Marconi House, Strand, W.C.2.—"The Relay Recorder" for May, containing, in addition to notes on the "Relay" system, a number of interesting little articles.

WESTINGHOUSE ELECTRIC INTERNATIONAL CO., Westinghouse Building, 2, Norfolk Street, Strand, W.C.2.—Three illustrated pamphlets describing the company's "Sentinel" circuit breakers for washing machines, &c., line-starters for squirrel-cage motors, and the thermal overload relay used with the latter, enclosing a sample of the metal employed.

THE MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, W.1.—Coloured showcards illustrating various types of "Sterling" variable and fixed condensers, and examples of transformers and chokes.

THE ARMORDUCT CABLE CO., LTD., AND REDUCED, 159, Westminster Bridge Road, S.E.1.—A booklet describing a new non-breaking non-kinking damp-proof flex.

THE FACTORY EQUIPMENT CO., 180, Windsor House, Victoria Street, S.W.1.—A price list of various types of pulley blocks.

THE EDISON SWAN ELECTRIC CO., LTD., 123-125, Queen Victoria Street, E.C.4.—A pamphlet describing the R.C.610 valve for resistance coupling.

MESSRS. PETTERS, LTD., Westland Works, Yeovil.—A brochure dealing with "M" type oil engines and their applications.

MESSRS. WARD & GOLDSTONE, LTD., Frederick Road, Pendleton, Manchester.—List No. E.12, describing battery eliminators for radio work, including valve, electrolytic, and d.c. types. Priced and illustrated.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—May price sheet of electrical materials, appliances, and accessories.

MESSRS. LACY-HULBERT & Co., LTD., 91, Victoria Street, S.W.1.—A pamphlet containing illustrated details and prices of "Boreas" electrically-driven air compressors and tire inflators.

MESSRS. FREDERICK J. GORDON & Co., LTD., 92, Charlotte Street, W.1.—A priced and illustrated catalogue of the leading makes of accumulators and dry batteries and accessories.

MESSRS. J. H. TUCKER & Co., LTD., King's Road, Tyseley, Birmingham.—An illustrated folder containing details and prices of small ironclad switch- and fuse-gear.

ATELIERS DE CONSTRUCTIONS ELECTRIQUES DE CHARLEROI, 56, Victoria Street, S.W.1.—May stock list of dynamos and motors.

Aluminium in America.

We quote the following from an April issue of the *American Metal Market*:—"Several railroads in the country have constructed trains employing aluminium extensively, 'bus makers are expanding rapidly, and the general automotive trade is swinging back to aluminium and its light alloys on a scale unsuspected by the uninformed observer. The aircraft industry, destined to become one of the chief outlets for aluminium, is probably operating at a heavier rate to-day than at any time since the war, with encouraging prospects for still greater activity in the near future. In the high-voltage transmission field aluminium is established and recording almost uninterrupted gains from year to year."

Wimbledon's Electricity Service.

The chief engineer and manager of the Wimbledon Corporation electricity undertaking (Mr. A. E. McKenzie) has sent us a recently-issued booklet. This announces reductions in the prices of electricity, and contains a great deal of information regarding the hire and hire-purchase of appliances of all kinds. A number of the leading electrical manufacturers advertise their cookers, washers, water heaters, &c., many of which are supplied by the department. A novel feature of the cooker-hiring scheme is the fact that no rental is charged for the December or March quarters if the quarterly consumption of the appliance is 300 kWh or more.

Unemployment.

The official returns dated April 25th show that the total number of unemployed was 1,044,800, as compared with 1,106,440 on April 18th, a decrease of 61,640. The total on April 26th, 1926, was 981,877.

The Paris Fair.

Among the exhibitors at the Paris Fair which is being held from May 14th to 29th is the Compagnie Française Wild-Barfield, which will show examples of its electric furnaces.

Local Exhibition.

STEPNEY.—Mention was made in our last issue of the electrical exhibition organised by the Stepney Borough Council at the People's Palace, Mile End Road. Among the exhibitors was the General Electric Co., Ltd., whose excellent display is shown in the accompanying illustration.

The G.E.C. Stand at Stepney.

Book Notices.

"Standards Year Book, 1927"; Miscellaneous Publication No. 77 of the U.S.A. Bureau of Standards. Pp. 392; figs. 39. Price $1.—This book outlines the activities and accomplishments of the Bureau of Standards and other agencies of the Federal Government and the States and Municipalities, and also the American societies and associations of which standardisation is a major or very important activity.

"Simplified Practice Recommendation" of the U.S.A. Bureau of Standards. No. 56. Carbon brushes and brush shunts (5 cents).

Circular of the U.S.A. Bureau of Standards. No. 319. Alphabetical index and numerical list of U.S. Government master specifications, promulgated by the Federal Specifications Board.

The Admiralty has issued tables of the velocity of sound in pure water and sea water, for use in echo-sounding and sound-ranging (H.D. 282). They are to be obtained from Mr. J. D. Potter, 145, Minories, London, E.1, price 1s. 2d. post free.

"Hydro-Electric Hand Book," by W. P. Creager and J. D. Justin. Pp. xxiv+897; 494 figs. London: Chapman and Hall, Ltd. Price 40s. net.

We have received from British Insulated Cables, Ltd., a well-printed 35-page brochure, wherein is reproduced a series of photographs illustrating the overhead trolley wire supporting structures, some of which are of unusual designs, in connection with the electrification work which the company carried out for the Great Indian Peninsula Railway.

Electrical Appliances on an L.C.C. Estate.

The whole of the heating and cooking apparatus for the L.C.C. housing estate, Castelnau, Barnes, will be supplied by the CABLE ACCESSORIES CO., LTD., and the kettles and irons by PREMIER ELECTRIC HEATERS, LTD.

A Siemens-Schuckert Development.

It is announced that the Siemens-Schuckertwerke has taken over from the Swiss Brown, Boveri Co. the majority of the shares hitherto held by the latter in the Isaria Meter Works Co., of Munich. This means an extension of the sphere of the Berlin company, which only a few weeks ago was able to establish itself industrially in the western coal and steel region by the acquisition of the electro-technical department of the Deutsche Maschinen A.G.

Irish Free State Electrical Imports.

The imports of electrical goods, excluding machinery, into the Irish Free State during March last amounted to a value of only £35,949, as compared with £38,065 in the corresponding month of 1926. The aggregate imports during the first three months of the present year are returned at £108,322, as compared with £129,187 in the first quarter of the last year.

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E.D.A. Activities.

Among the latest publications of the British Electrical Development Association is a booklet dealing with battery-charging equipment for electric vehicles (E.D.A. 653). This contains notes for non-technical users on modern apparatus and methods, with a number of illustrations.

A Colonial Conference.

A conference of representatives of the Colonies was held at the Colonial Office this week. Among the questions discussed were trade agencies in London and radio communication and broadcasting.

The Liverpool Cable Co.'s Football Team.

The stalwart group depicted herewith is the football team of the Liverpool Electric Cable Co., Ltd. The team has had a

The Liverpool Cable Co.'s Football Team.

very successful season, winning the Liverpool Citizens' League Championship Cup and the Liverpool Citizens' Challenge Cup.

Sussex Contractors' Dinner.

The annual dinner of the Sussex Branch of the Electrical Contractors' Association was held at Brighton on May 4th. Mr. H. L. Smith, who was chairman for two years, presided, and the guests included the president of the Association (Mr. H. J. Miles) and the Mayor of Brighton. The chairman, proposing the toast of "The Corporations of Brighton and Hove," said that the relations of those bodies with the contractors, by means of working agreements, were very amicable; the Mayor of Brighton replied. Mr. F. Winstanley proposed the toast of "The E.C.A. Allied Associations and Officials." In reply, Mr. Miles referred to the fact that the attendance that evening was over 80, whereas only 13 or 14 attended the first annual dinner. That growth was typical of the growing strength of the Association. He called upon members to aid the Government in making the new Electricity Act a success. Mr. L. C. Penwill (secretary, E.C.A.) also responded. Among the other speeches was one by the newly-elected chairman of the branch (Mr. H. L. Holford), who proposed the visitors' health.

Merchandise Marks Acts.

The *Board of Trade Journal* for May 5th contains a joint memorandum by the Board of Trade and the Commissioners of Customs and Excise respecting the requirements as to marks on imported goods.

Trade Announcements.

Mr. Marcel Porn, of 72-78, Fleet Street, London, E.C.4, has converted his business into a private limited company, under the name of PORN & DUNWOODY, LTD. Particulars appeared in our issue of April 29th, page 688. Mr. Porn is managing director of the new company.

MR. M. THORBURN, 14, Cavendish Vale, Sherwood, Nottingham, formerly representative in Nottinghamshire, Derbyshire, and Lincolnshire for the Siemens & English Electric Lamp Co., Ltd., and other companies, has now joined Messrs. H. R. Cleare & Co., Ltd., Bristol, and will represent them in the same area.

Mr. H. A. CHARD, late sales manager to the Electric Art shades, of Kelvedon and Regent Street, W.1, has been appointed general manager of the firm.

MESSRS. HOUGH BROS., radio engineers, have opened premises in High Street, Huntingdon.

THE COUNTY ELECTRICAL AND WIRELESS STORES, LTD., Deal, has closed its premises at 7, South Street, and the business will now be carried on at 19, High Street.

MESSRS. A. EMANUEL & SONS, LTD., have opened a new electrical fittings showroom at 9, George Street, Manchester Square, W.1. A very wide selection of lighting fittings is on view.

THE GENERAL RADIO CO., LTD., has opened large radio display and demonstration rooms at 105, Regent Street, W.1, in which all kinds of up-to-date receiving apparatus and testing equipment are shown in use.

Recent Contract.

The ELECTRIC FURNACE CO., LTD., informs us that the aluminium-annealing furnace which it is supplying to a Scottish undertaking (*vide* ELEC. REV., April 29th) embodies the Wild-Barfield principle of grooved bricks.

The American Refrigerator Industry.

Mr. A. Williams, vice-president of the New York Edison Co., recently stated that 600,000 electrical refrigerators will be manufactured this year, as compared with 200,000 last year. The estimate for 1927 is based on the sales during the first quarter. Reports of the manufacturers, Mr. Williams said, indicate that the electrical refrigerator is finding favour not only in the cities and towns, but in many out-of-the-way places. Wherever electrical power is available, it is being installed rapidly. In 1914 only 600 electrical refrigerators were sold in the United States. In 1924 the sales had risen to 24,000, in 1925 to 75,000, and in 1926 to 200,000. These figures do not include the larger refrigerators sold for hotels and other commercial purposes.

Hungarian Radio Import Regulations.

By a recent ordinance radio receiving apparatus may now be imported into Hungary without restriction by anyone having a licence for the "production, sale or maintenance and use" of a receiving apparatus. The importation of radio broadcasting apparatus and parts is, however, still subject to the permission of the Minister of Commerce. Consignments of apparatus will still be cleared by the Budapest Central Customs Office, and will only be delivered to the addressee if he can produce the necessary licence. The regulations also apply to the movements of apparatus within the country.

Storage Batteries in Australia.

In the course of a recent debate in the Federal House of Representatives, reports the *Daily Telegraph* (Sydney), Mr. Coleman (N.S.W.) said that complaints had been made that storage batteries, which were provided for in the last tariff schedule, and which prior to their manufacture in Australia were sold at £11 10s., were now being dumped. There were now six manufacturers in Australia, and the overseas article had been reduced to £5 5s. and £6 6s., with a 40 per cent. discount to garages, as against 25 per cent. previously. Mr. Pratten, Minister for Trade and Customs, said the statement suggested a triumph of protective policy, in the direction of reducing prices to the consumer by the competition created by local manufacture.

Correction.

We wish to direct our readers' attention to an error which occurred in the advertisement of Messrs. Parmiter, Hope and Sugden on page xxviii in our last issue. The company's old address was given instead of Fluvent Electrical Works, Vernon Street, Longsight, Manchester.

For Sale.

Darlington Corporation Electricity Committee invites offers for one 220/280-kW steam generating set. (See our advertisement pages to-day.)

Prices of Raw Materials.

Messrs. James Forster & Co., in their report on lead, stated on May 7th:—"The market has been marking time this week with small daily fluctuations. . . . A fair amount of buying by home consumers has been seen, cable-makers taking moderate quantities, but not enough to give the needed fillip to the market. . . . Reports from the Continent are optimistic. . . . The weak spot is in America, and the future largely depends upon the course events take in that country."

Messrs. F. Smith & Co. report, May 10th:—Copper (electrolytic) bars, £61 15s., 5s. inc.; do. do., sheets, no change; do. do. wire rods, £71 15s., 5s. inc.; do. do. H.C. wire, no change.

Messrs. James & Shakespeare report, May 10th:—No change in the prices of copper bars (best selected) sheet and rod: English pig lead, £27, 5s. dec.

Messrs. Edward Till & Co. report, May 10th:—No change in the price of india-rubber, para fine.

Lighting and Power Notes.

Algeria.—NEW POWER STATION.—In order to meet the increasing demand for electricity supply the Société Algerienne d'Eclairage et de Force is about to commence the establishment of a new steam-operated power station on the Mole at the port of Algiers. The output of the existing station advanced last year to 44,463,925 kWh from 39,033,907 kWh in 1925.

Australia.—CAIRNS (Q.).—The Cairns Hydro-Electric Board has received a report from Mr. P. A. W. Anthony recommending the harnessing of the Barron Falls without delay. The cost of the scheme is estimated at £202,500, made up as follows:—Plant, £180,000; transmission line and reservoir, £19,500; line to Cairns, £3,000.

SHOALHAVEN RIVER DEVELOPMENT.—The *Electrical Engineer of Australia and New Zealand* states that investigations are being made of the economics of a proposal to generate hydro-electric power from the Shoalhaven River, N.S.W. It is estimated that 50,000 kW can be developed at a cost of £2,413,000 from power stations at Sewell's Point and Murray's Bend. This scheme would provide energy for Canberra amongst other places.

Canada.—HYDRO-ELECTRIC DEVELOPMENT.—Projects which will entail large expenditure in the development of natural resources in Albert and Westmoreland counties of south-eastern New Brunswick are before the Government and Legislature of the Province. A Bill, which has received its first reading, is to incorporate the Petitcodiac Tidal Power Company and would give the right to develop hydro-electric power on the confluence of the Memramcook and Petitcodiac rivers. It has been estimated that a minimum of 100,000 h.p. and a maximum of 200,000 h.p. can be developed and that the cost of the entire development would be $23,000,000.

Development of Albert County oil shales is also before the Government. The Maritime Education Co., Ltd., has been interested in this project and has carried out preliminary work. It is proposed to spend $150,000 this summer on plant erection, and the undertaking has been underwritten by New York financial interests.

Chichester.—ELECTRICITY IN BULK.—The Corporation, on the recommendation of the Electric Light Committee, has consented to the Bognor Gas Light and Coke Co. laying a cable within the Corporation's area of supply, *viz.*, from the boundary of the parish of Pagham to the Corporation's sub-station at the Anchor Inn, Sidlesham, for the purpose of enabling the company to receive a supply of electricity in bulk, the draft agreement, as altered on behalf of the company for the supply through the Chichester cables, having been approved.

Cornwall.—INAUGURATION OF POWER STATION.—The first stage in the electrical development of the Fowey, Par, St. Blazey, and St. Austell districts of Cornwall was completed on May 7th, when the Lord-Lieutenant of the county inaugurated the new power station of the St. Austell and District Electric Lighting and Power Co., Ltd., at Pont's Mill, St. Blazey. The plant includes two 300-h.p. and one 200-h.p. Diesel engines and three dynamos. Electricity is transmitted to Fowey, Par, St. Austell, and other places. Provision has been made for further extensions as required.

Continental.—FRANCE.—The Société Electrique du Nord-Ouest, in its report for the past year, states that all its power stations are now interconnected so that a supply can be given throughout the whole of its area, which includes the towns of Amiens, Arras, Dunkirk, Calais, Boulogne, and Abbeville. The company has now about 280 miles of 45,000-, 90,000 and 150,000-V transmission lines in operation. The sales of electricity during the last financial year showed an increase of 21 per cent. over 1925-26.

Steady progress is being made with the construction of the hydro-electric power stations which the Société de l'Energie du Rouergue is establishing to utilise the water power of the River Tarn. The company has recently secured the concession for a h.p. transmission line from Le Truel to Beziers with an extension to Pinet and a branch to Mâdiere. Contracts have also been secured for the supply of large quantities of electrical energy to the Société Sud Electrique, the Société d'Energie Electrique de la Sorgue et du Tarn, the Office Nationale de l'Azote of Toulouse, and the Société Vieille Montagne, whose hydro-electric plant at Thuries, which has an output of 20 million kWh per year, will be connected with the transformer station at Pinet, and in future be operated by the Rouergue Co.

ITALY.—The output of the various plants of the Società Ligure Toscane d'Elettricità during the past year amounted to 189,019,400 kWh, as compared with 171,084,400 kWh in 1925. In order to meet the increasing demand the company is engaged on the construction of a new steam-operated power station of 60,000 h.p. and the erection of a 120,000-V transmission line to connect with the power stations at Valdarno and Adamello.

Epsom.—ELECTRICITY FOR HOUSING ESTATE.—The Urban District Council has applied for sanction to a loan of £3,100 for laying cables to supply electricity to Council houses on the Horton Estate. It has also decided to purchase 120 electric cookers to be installed in the houses.

Grangemouth.—ELECTRICITY SUPPLY.—The Town Council has granted an application by the Scottish Central Electric Power Co., for permission to lay a 6,000-V cable underground along Earl's Road, from Larbert to a sub-station in Bridge Street, Grangemouth. Consent was refused to an application by the Scottish Midlands Electric Supply Co., Ltd., to erect an overhead l.p. line between Grangemouth and Skinflats.

Hull.—LOAN SANCTIONED.—The Electricity Committee has received sanction to the borrowing of £3,150 for the purchase of land for railway sidings at Sculcoates Lane generating station and for sub-station sites in Clarendon Street and Plane Street.

SUPPLY TO HOUSING ESTATE.—The Committee has informed the Housing Committee that it will be prepared to lay mains on the East Hull Housing Estate if the Housing Committee will undertake to wire the whole of the houses on the estate.

Iceland.—HYDRO-ELECTRIC DEVELOPMENT.—It is announced from Copenhagen that the Lower House of the Icelandic Alting has approved by 12 votes to 9 the granting of a concession to the Norwegian A.S. Titan for the utilisation of the water power of the River Tjorsaa in the South of Iceland to the extent of 160,000 h.p. Under the concession the company would have to construct a railway from Reykjavik to the South of Iceland, and the State would participate in the expenditure on this line. The bill is now under the consideration of the Upper House.

Irish Free State.—DUBLIN.—At a recent meeting of the City Commissioners it was reported that the Department of Industry and Commerce had sanctioned the expenditure of £150,000 on the work in connection with the electricity undertaking.

Leeds.—LOAN SANCTIONED.—The Corporation Finance and Parliamentary Committee has received sanction to the borrowing of £500,000 for the erection of the new power station on Bedcote Farm Estate, Kirkstall.

Leicester.—LOAN.—The Electricity Committee has recommended to the Corporation that application be made for sanction to a loan of £640,000 for extensions to the electricity undertaking.

Liverpool.—LOANS.—Application is being made by the Electricity Committee for sanction to the borrowing of the following loans: Main transmission line, Lister Drive to Aintree, £36,742; transforming plant, £18,291; switchgear, £9,500; construction of main transmission lines—Lister Drive to Smithdown Road, £30,306; Lister Drive to Lark Lane, £32,493; Lister Drive to Beaumaris Street, £37,082.

London.—HACKNEY.—The Electricity Committee has submitted a report to the Borough Council on extensions to the electricity undertaking to be carried out during the periods 1927-28 and 1929-30. For the period 1927-28 an expenditure of £131,400 is proposed, which would include the substitution of one 10,000-kW turbo-alternator for the 5,000-kW set at present in use, and the installation of additional plant and equipment at six sub-stations. During 1929-30 extensions are recommended involving an estimated expenditure of £199,890. This would include further additions to existing, and the erection of new, sub-stations, and the laying of e.h.p. feeders. The Committee has recommended that application be made to the London and Home Counties Joint Electricity Authority and the Electricity Commissioners for sanction to the scheme and necessary loans.

WIMBLEDON.—The Corporation Electricity Committee has received sanction to the borrowing of £80,000 for mains and services, and £4,000 for sub-stations and equipment.

SOUTHWARK.—The Electricity Committee has approved an estimate prepared by the borough electrical engineer for new mains and services during the financial year amounting to £7,190.

Lytham-St. Annes.—LOAN SANCTIONED.—Sanction has been received by the Town Council to the borrowing of £33,000 for mains, meters, and services.

Mexico.—HYDRO-ELECTRIC DEVELOPMENT.—A new hydro-electric power plant with a capacity of 100,000 h.p. is to be established on the River Lerma by the Mexican Light and Power Co., Ltd.

Northern Ireland.—WARRENPOINT (Co. ANTRIM).—At the last meeting of the Urban District Council it was decided to offer no objection to either the Warrenpoint Gas Consumers' Co., Ltd., or Mr. J. U. Finney, Banbridge, applying to the Electricity Commissioners for Northern Ireland for powers to supply electricity in the town.

Nottingham.—ELECTRICITY ACCOUNT.—A report of the Electricity Committee, which has been presented to the City Council, states that whilst a profit of £22,000 was made during the past year, it is undesirable to allocate any portion of it to the relief of rates, in view of the fact that it is hoped shortly to reduce the charges for electricity.

Peterhead.—PROPOSED NEW POWER STATION.—The Town Council has agreed to give the Electric Supply Corporation, Ltd., a site in Ugie Street for the erection of a generating station. The consent of the Electricity Commissioners has not yet been obtained to the scheme.

Preston.—ELECTRICAL DEVELOPMENT.—Rapid progress is now being made with the various extensions of the electrical distribution system from Ribble power station. The Blackburn-Preston cable is now practically completed, and a commencement has been made with the Blackpool overhead cable.

Price Reductions.—Reduction in the charges for electricity have been made or recommended in the following districts:—

WIMBLEDON.—General lighting: From 4½d. to 4d. per kWh. Basement and cellar lighting (business premises): From 3½d. to 3d. per kWh. Shop window lighting (time switch): From 2d. to 1d. per kWh. Outside advertising signs: From 4½d. and 2d. to 4d. and 1d. per kWh. Maximum demand system (rental wiring): The rental of 2d. per point per week throughout the year reduced to 1½d. during the summer quarters. Water heaters (continuously in circuit): From ¾d. per kWh during the summer and 1d. during the winter to ½d. per kWh by separate meter all the year round. Reductions have also been made in the kinema and industrial power supplies.

SOUTHPORT.—Power (maximum demand system): First 90 kWh per kVA of maximum demand, 2d. per kWh; next 30 kWh, 1½d.; beyond 120 kWh, 1d. per kWh.

ALDERSHOT.—Ordinary lighting: From 8d. to 7d. per kWh. Factory and outside lighting: From 6d. to 5d. per kWh. Power: Existing rates up to 10,000 kWh to continue; from 10,000 to 15,000 kWh, from 2½d. to 2¼d.; 15,000 to 20,000, from 2¼d. to 2¼d. per kWh; all energy in excess of this amount,

from 2½d. to 2d. per kWh. Kinemas, &c.: First 100 kWh per week, from 8d. to 7d. per kWh; beyond, from 4½d. to 3½d. per kWh.

Shaldon.—INAUGURATION OF SUPPLY.—An electricity supply for the district was recently formally inaugurated. Electricity is obtained from the Newton Abbot generating station and is being conveyed to Shaldon by an 11,000-V cable laid in the bed of the river.

Sheffield.—ELECTRICITY SUPPLY.—In connection with the recommendation of the Electric Supply Committee to obtain authority to incur the expenditure necessary to proceed with the installation of an additional 20,000-kW set at Blackburn Meadows, the general manager states that he has been in communication with the Electricity Commissioners to ascertain if such proposals agree with the arrangements which they are contemplating for the development of electricity supply in this area. The Commissioners have replied that they are now making a survey of an area which includes Sheffield and anticipate that they will be in a position to publish the scheme during the autumn. They are therefore of opinion that the position of Sheffield will not be prejudiced by delaying a decision until after the scheme for that area has been formulated. The Committee has decided to inform the Commissioners that further generating plant is urgently required to meet the increased demand anticipated in the near future, and that it is therefore imperative that it should be informed at an early date of the Commissioners' contemplated arrangements.

LOANS SANCTIONED.—The Committee has received sanction to the borrowing of £1,122 for the Roach Road substation, £12,150 for mains, £4,300 for converting plant, £3,918 for switchgear and building work, £31,782 for mains, and £75,000 for sub-station equipment.

South Africa.—CAPE TOWN.—According to the *South African Engineer*, the Corporation's programme of electrical development for the years 1927, 1928, and 1929, involves a total estimated expenditure of £500,000, made up as follows:—Land and buildings for 18 static transformer sub-stations 11,000-380-200 V, £30,000; equipment of new and extensions of equipment in a total of 40 sub-stations, £88,400; extensions of and additions to generating plant and equipment, £87,750; provision of new d.c. feeders and further instalment of reconstruction of l.p. distribution network, £83,000; additional street lighting, £12,500; extensions of mains, £30,000; provision for altering network in central city area from overhead to underground, £10,000; new 11,000-V, 3-phase feeders, £32,850; new l.p. feeders, £40,000; provision for respective portions of cost of tie feeders and other cables for joint operation of Council's and Electricity Supply Commission's generating stations, £25,500; share of supervisory control and telephone communication throughout combined E.S.C. and Council's systems, £10,000; extension of mains outside municipal area, £50,000. The plant extensions include an additional 7,500-kW turbo-alternator and two 50,000-lb. water-tube boilers with auxiliary equipment, practically all of which is already on order, and will be installed within the next few months.

Special Orders.—Applications have been made to the Electricity Commissioners for Special Orders by the Cumberland Waste Heat Owners Co., Ltd., authorising it to supply electricity within part of the rural district of Whitehaven, and the Urban District Council of Wivenhoe to supply electricity in the urban district.

Watford.—POWER STATION EXTENSION.—The Corporation Electricity Committee has approved the expenditure of £65,500 for the extension of the power station, the Committee not being in favour of a bulk supply from the North Metropolitan Electric Power Supply Co., Ltd.

LOAN.—The Committee is applying for sanction to borrow £7,000 in respect of underground mains and sub-station buildings and equipment at King's Langley.

EXTENSION OF SUPPLY.—An application from the Berkhampsted Rural District Council for a supply of electricity to Bourne End is under consideration.

West Ham.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £35,486 for electricity purposes, and £45,000 for the provision of additional offices, &c., in Romford Road, for the Electricity Department.

York.—EXTENSION OF SUPPLY.—The City Council has decided to extend its area of electricity supply to the villages of Stockton-on-Forest, Shipton, Naburn, and Acaster. The laying of the necessary cables will cost £7,630.

Tramway and Railway Notes.

Australia.—SYDNEY SUBURBAN RAILWAYS.—The *Industrial Australian and Mining Standard* reports that the New South Wales Minister for Works and Railways (Mr. Flannery), has supplied the following information regarding the electrification of the various sections of the Sydney suburban system:—Bankstown line.—Electric service commenced, October 10th, 1926; electric service to be completed, July 1st, 1927. Milson's Point to Hornsby.—Service to commence July 1st, 1927; complete service, December 31st, 1927. Main suburban line to Homebush.—Service to commence, December 1st, 1927; complete service, January 1st, 1929. Liverpool and Bankstown to Regents Park.—Service to commence, January 1st, 1929; complete service, April 1st, 1929. Homebush to Parramatta.—Service to commence April 1st, 1929; complete service, November 1st, 1929. Granville to Cabramatta.—Service to commence, November 1st, 1929; complete service, March 1st, 1930. Strathfield to Hornsby.—Service to commence, March 1st, 1930; complete service, November 1st, 1930. Mr. Flannery states that this programme is subject to the necessary funds being made available as required. When the whole city and suburban electric system is completed there will be in the city proper 22 miles of track and nine stations, and a total of 221 miles of track is to be electrified in the suburban zone. For the electrified system about 1,200 cars will be required. During the year ended June 30th last, more than 100,000,000 passengers were carried on the suburban railways. The direct result of the completion of the electrification of the first section of the suburban lines (from St. James to National Park, a distance of 19 miles) has been an increase in revenue on that section of 20 per cent., although the work has been completed for only a little more than four months. The total cost of the works at present in hand and chargeable to railway capital are:—Sydney Harbour Bridge (two-thirds debitable to railway capital), £4,000,000; city railway, £6,950,000; electrification and widening of suburban lines, immediately necessary, £8,981,000; new rolling stock, £5,805,000; total £25,736,000.

Continental.—AUSTRIA.—The Austrian State Railway authorities are preparing two new railway electrification schemes. The first scheme, which will occupy a period of five years, includes the electrification of about 380 miles of track and comprises the Vienna-Salzburg and Vienna-Gratz-Nauer lines. The second plan provides for the electrification of about 475 miles.

FRANCE.—New electric local railways have lately been completed and opened for traffic between Champagnole and Boujailles and between Champagnole and Froncine-le-Haut in the Department of Jura, the total length of the lines being about 32 miles.

Irish Free State.—PROPOSED RAILWAY RECONSTRUCTION.—English visitors, believed to be members of a British syndicate, recently visited Portumna, Co. Galway, and inspected the disused railway from that town to Birr, in King's County, a distance of nearly 20 miles. The inspection was carried out with a view to the possibility of reconstructing the railway to carry on the service with power obtained from the Shannon scheme later. The visitors were satisfied that the reconstruction of the line would present very little difficulty, and in connection with the Shannon scheme, might easily become a paying proposition.

Japan.—RAILWAY SCHEMES.—The Tokio suburban electric railway lines are being extended in all directions. The Nanbu Railway line from Kawasaki station on the Government Keihin line to Noborido, crossing the Tokio-Yokohama Railway line, was opened for traffic on March 10th. This railway is to eventually join the Tamagawa Railway and the Odawara Rapid Transit Railway. The Odawara Rapid Transit Railway with a length of 50 miles, from Shinjuku (Tokio) to Odawara, was to be opened in April. The Seibu Railway's new line from Takata-no-Baba Station on the Government Yamate line to the Higashim-Urayama station on the Government Kokubunji line will be opened shortly. Other railways to be opened are the Meguro-Kamata Railway Co.'s Oi-Shibuya line, and an extension of the Ikegami Railway.

On March 7th the inaugural meeting of the Nikko Mountaineering Railway Co., Ltd., was held. The company will construct an electric railway from Myowaga-hara to Chugu Temple.

The I.G.R. has decided to complete the electrification of the Hachioji-Kofu iine during the next five years at an outlay of 8,906,000 yen. Four sub-stations will be erected between Hachioji and Kofu. The system will be 1,500 V. The Hachioji-Otsuki section will be completed by the fiscal year of 1929-1930, and the Otsuki-Kofu section between the fiscal years 1929-1930 and 1930-1931.

London.—L.C.C. TRAMWAYS.—The estimates for the year 1927-28 in connection with the L.C.C. tramway undertaking show that the revised estimated deficiency for the year 1926-27 is £302,114. It was originally estimated that there would be a net deficiency of £127,330. The revised estimated surplus on working is £178,575, as compared with the original estimate of £407,795. The financial loss during the general strike is estimated at £74,000, and the additional cost of fuel due to the coal dispute at £152,000. Apart from these two factors, therefore, the original estimated gross surplus would have been practically maintained in the revised figures.

Manchester.—LOAN.—The City Council has approved a recommendation of the Finance Committee that application be made for sanction to a loan of £155,000 for reconstruction of the Middleton Light Railway and the erection of a garage in Queen's Road. The light railway was recently purchased from the Middleton Electric Traction Co., Ltd.

Nottingham.—YEAR'S WORKING.—Although results were marred by the coal strike, the working of the Corporation tramway system during the past year was satisfactory. Total receipts, including rent of leased lines, amounted to £423,092, this being a decrease of £19,813, as compared with the pre-

vious year, and the working expenses were £317,550, an increase of £2,461. After meeting capital charges and making contributions to the reserve and renewals funds, a sum of £20,000 was transferred to the borough fund. The Corporation now owns 200 tramcars, 45 motor omnibuses, and 10 railless cars. During the year 74 million passengers were carried by the combined services.

Stretford.—EXTENSION OF TIME.—The Urban District Council has given notice of its intention to apply to the Ministry of Transport for permission to extend by one year the time for the completion of the railways authorised by the Stretford Light Railways Order, 1906, and of Railway No. 10 authorised by the West Manchester Light Railways (New Lines, &c.) Order, 1906.

United States.—PHILADELPHIA.—Delivery of equipment for the Philadelphia subway has commenced. The cars are being constructed by the J. G. Brill Co., and the motors, control and other equipment for the first 150 cars have been delivered by the Westinghouse Electric and Manufacturing Co. According to *Electric Traction*, each car will carry two motors, the motor rating being 200 h.p. The control is the ABF type for rapid transit service, having a special automatic feature that allows the controller handle to be turned to the full "on" position at once and the car will then automatically accelerate. The cars will be 67 ft. long, 10 ft. wide, and 12 ft. 3 in. from rail to roof. The construction includes longitudinal seats for 25 passengers and transverse seats for 50 passengers. Each car is equipped with six double doors, three on each side. The total weight, completely equipped, will be 105,000 lb. These cars will embody every conceivable safety device, including automatic stop control, and when completed will constitute the most perfect group of this kind of rolling stock. The Westinghouse Co. is also manufacturing 750 specially-designed electric fans for the ventilation of the new cars. The total cost of the subway is estimated at $100,000,000.

Telegraph and Telephone Notes.

Continental Telephony.—HOLLAND-SWITZERLAND SERVICE.—The Postal and Telegraph Administration announces that on and after May 16th direct telephone communication will be opened between all offices in Holland and Switzerland.—*Reuter* (Amsterdam).

Germany.—SHIP-SHORE TELEPHONY.—It is reported from Hamburg that experiments are in progress with the object of connecting steamships and other vessels, when in port, with the local telephone system.

Guatemala.—WIRELESS TELEGRAPHY.—An arrangement with the Tropical Radiotelegraph Company (a subsidiary of the United Fruit Company organised to handle the radio business of its steamships and stations in the United States) has been concluded by the Government for the connection of the State radio station with the Fruit Company's system in Central America. The Tegucigalpa (Honduras) station has been decided upon as the connecting link with the other five States, and the Company's station in New Orleans will connect with the rest of the world and transmit Press messages at a discount of 50 per cent. on the actual rates. By special arrangement with the Minister of Promotion, messages of general interest up to 300 words from the Press of Guatemala City to that of San Salvador will be sent free of charge.—*Reuter's Trade Service* (Guatemala City).

Italy.—REPORTED WIRELESS DISCOVERY.—Signor Majorana, Professor of Physics at the University of Bologna, has written to the Reale Accademia dei Lincei at Rome, claiming to have discovered a system of wireless telephony in which ultra-violet rays are employed. In experiments made between Bologna and a place 16 kilometres distant conversations were, it is said, carried on with great clearness and in secrecy.—*Reuter* (Rome).

The Telephone Service.—"TANDEM" EXCHANGE.—The new "Tandem" exchange, which, by means of junction lines, will enable any London exchange to be accessible to all the others during the transference of the system from manual to automatic switching, has been completed, and is being tested by means of artificial traffic.

LARGE PRIVATE EXCHANGE.—A new automatic telephone exchange, the largest private installation in Scotland, has been opened by the Glasgow Corporation. The exchange is built on the expanding bookcase system, and is fitted with duplicate ringing machines; while the central switching apparatus has a capacity for 500 lines, the total number of lines now working is 221 of all classes, including 41 external lines connecting outside departments with the City Chambers. The automatic equipment was installed by the Relay Automatic Telephone Co., Ltd.

Wireless at Sea.—SHIPS' "AUTO-ALARMS."—At the annual meeting of the Marconi International Marine Communication Co., Ltd., its managing director (Mr. F. G. Kelleway) announced that the authorities in this country were on the point of issuing rules governing the installation on merchant ships of the "auto alarm," actuated by a special signal which, in time of distress, would give audible warning of the need for help, and summon to the wireless apparatus on the ship where the alarm was received the telegraphist who at the time might be off duty.

Radio Notes.

Atmospherics.—AN INVESTIGATION.—The Royal Meteorological Society recently issued a report on an attempt to ascertain the range of atmospherics; that is, how far away are the storms that produce the X's which interfere with reception in England. The Society, with the co-operation of the B.B.C., appointed observers in various parts of Europe, equipped with broadcast receivers and advance copies of certain talks transmitted simultaneously by B.B.C. stations, to which they listened. Whenever they heard a strong atmospheric they put a mark on the manuscript through the syllable on which it occurred. At the same time automatic direction finders in Aberdeen, London and Egypt, recorded the directions of atmospherics which occurred when the talks were taking place. When the papers were gathered and compared with the records made by the direction finders, the results were remarkable, says the *Evening News*, which explains that in several cases atmospherics were observed at identically the same moment by listeners in Madeira, Ireland, Germany and Norway, and the direction finders showed that the thunderstorm responsible at the moment was situated somewhere in the West Atlantic. The results show that atmospherics may be due to storms taking place perhaps 4,000 or 5,000 miles away. Instructive observations of a similar nature are contained in I.E.E. papers (Vol. 63, No. 346, and Vol. 64, No. 353), by Capt. H. J. Round and Mr. R. A. Watson Watt, respectively.

Lithuania.—NEW LICENCE FEES.—The Lithuanian Parliament (Seimas) has adopted a new radio tariff which is already being provisionally put into operation by the institutions concerned. According to *World Radio* the monthly charge for a receiving set installed in private dwellings, State and Municipal institutions, by cultural and charitable organisations and in newspaper offices, if special taxes are already being levied, is as follows:—In towns: (*a*) crystal detector, tenpence; (*b*) valve receiver, 2s. 1d. In villages and other localities: (*a*) crystal set, fivepence; (*b*) valve set, 1s. 3d. For a receiving set in restaurants, clubs, shops, kinemas, and similar public places, the monthly fee is to be: (1) in Kaunas and Klaipeda, one pound sterling; (2) in district towns, 12s. 6d.; and in other places, 4s.

United States.—100-kW VALVE.—For the past few weeks the high-powered transmitter of WGY, at Schenectady, N.Y., has been using a 100-kW vacuum power tube, which takes the place of eight 20-kW tubes. It is a development of the General Electric Co., and engineers are now securing data on its performance; with its water jacket, the tube stands 7¼ ft. high and weighs 100 lb., or 1 lb. per kilowatt, and it is used as a radio amplifier, fulfilling in the transmitter a function comparable with the radio-frequency stages in receivers. Outside its water jacket the tube is 5 ft. high, and two-thirds of this height consists of the copper envelope, 4 in. in diameter; the upper third is made of glass through which the filament leads and the grid lead find insulated entrance. The glass bulb is 22 in. long and 4 in. in diameter, and it is sealed to the spun-out end of the anode cylinder, or copper envelope, by a machine process in such a way as to make the junction of glass and copper mechanically strong and vacuum tight. Two copper cables capable of carrying several hundred amperes are connected to tungsten rods which, in turn, pass through a pinch seal terminating at the filament ends; three lengths of tungsten wire, each 16 in. long, connect to each of the inner leads, forming six parallel filament spans, which pass within the grid and meet at a common point at the filament spring suspension in the lower end of the tube. The grid, within the copper envelope, is cylindrical and has an over-all length of 3 ft. 5 in. The grid frame is a most ingenious structure of molybdenum and tungsten; bracing, such as is common in steel bridges and tower construction, provides strength with a minimum of metal; rigidity is necessary to prevent short-circuiting from swaying or sagging, and minimum metal in the grid structure facilitates exhaust and minimises the possibilities of gas evolution. The grid connection is brought out through an arm part way up the high-voltage glass bushing to a flexible outside grid terminal. To guard against failure due to pressure increase in the tube, an ionisation gauge is used which takes the form of a special three-element vacuum tube, in appearance much like an ordinary receiving tube; it is sealed to the large tube, connections to filament, grid and plate are made from the pressure-indicating device at the operating panel, and the gauge operates on the principle of the ratio of ionisation by collision with electrons to the pressure, or amount of gas present.—*T. & T. Age.*

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Aberdare.—June 2nd. Electricity Department. E.h.p. overhead and underground main and branch transmission lines. (See this issue.)

Armagh.—June 1st. Urban District Council. Heavy oil engine generating plant, underground and overhead mains. (See this issue.)

Australia.—MELBOURNE.—June 1st. Victorian Government Railways. Electric time-releasing mechanisms. (B.X. 3431.)*

July 5th. State Electricity Commission. One 15,000-kW steam turbo-generator and accessories. (B.X. 3369.)*

July 4th. 66,000-V and 22,000-V insulators for the Yallourn brown coal scheme. (May 6th.)

June 28th. Postmaster-General's Department. Jacks, switchboard instruments, &c. (B.X. 3474.)*

SYDNEY.—June 22nd. New South Wales Government Railways Remote-control switchgear. (B.X. 3442.)*

June 20th. Municipal Council. Turbo-alternators for Bunnerong power station. (B.X. 3443.)*

BRISBANE.—May 18th. City Electric Light Co., Ltd. Outdoor switchgear. (B.X. 3456).*

Basingstoke.—June 7th. Corporation. Electrical installations at the Council's housing estate (approx. 1,015 wiring points). (See this issue.)

Belgium.—ANTWERP.—June 20th. Municipal Council. 32 portal travelling electric cranes. (A.X. 4653.)*

Chile.—SANTIAGO.—July 18th. Chilean State Railways. Materials for electric lighting and power (Group 30). Materials for electric lighting of locomotives and coaches (Group 32). August 22nd. Signalling, telegraph and telephone supplies (Group 36). (C.X. 2271.)*

Dartford.—May 21st. Urban District Council. 1,062 yd. l.p. cable. (See this issue.)

Darton.—May 17th. West Riding Education Committee. Electric lighting installation at Darton Kexborough new school. Specifications from Education Department, County Hall, Wakefield.

Darlington.—May 23rd. Electricity Committee. One 500-kW rotary convertor, with transformer. (May 6th.)

Dublin.—May 23rd. Electricity Department. Pipework for the 5,000-kW turbo-alternator. (May 6th.)

Dundee.—May 19th. Electricity Department. 2-core and 4-core l.p. cable. D.c. and a.c. house-service meters. (May 6th.)

Edinburgh.—May 16th. East Lothian Education Authority. Works, including electric lighting installation, for the extensions, &c., at Macmerry Public School. Schedules from the surveyors, Messrs. R. & A. K. Smith, 44, Queen Street, Edinburgh.

Egypt.—CAIRO.—June 4th. Egyptian State Railways, Telegraphs and Telephones, Chief Inspecting Engineer, Queen Anne's Chambers, S.W. Underground cables (approx. £E12,000 to £E13,000).

May 28th. Ministry of Education. Electrical equipment for Beni Suef Trades School. (B.X. 3488.)*

Epsom.—Electricity Department. E.h.p. cable. (May 6th.)

Glasgow.—May 16th. Corporation. Electric light installations at a number of housing schemes. Mr. R. B. Mitchell, engineer, 75, Waterloo Street, Glasgow.

May 18th. Electricity Department. Materials for 12 months, including l.p. and e.h.p. cable, i.r. insulated cables and flexibles, meters, carbons, cast-iron boxes, section pillars. Mr. R. B. Mitchell, engineer, 75, Waterloo Street, Glasgow.

Glentanar, Aberdeenshire.—May 16th. Work in connection with the hydro-electric scheme, intake works on the River Tanar. Specifications from Messrs. Tawse & Allan, civil engineers and architects, 10, Bon Accord Square, Aberdeen.

Grimsby.—June 4th. Electricity Department. Sub-station equipment. (See this issue.)

Guildford.—May 16th. Town Council. Wiring 60 flats for electric light. Mr. J. W. Hipwood, borough surveyor, Tuns Gate.

India.—June 14th. India Stores Department, Simla. Generating sets for Fyzabad power station. (B.X. 3486.)*

London.—ST. MARYLEBONE.—May 18th. Electricity Department. L.p. and e.h.p. cables for 12 months. (April 15th.)

ISLINGTON.—June 1st. Electricity Department. Steel-tube lamp columns, 2,200-V feeder switchgear, rotary and/or static power factor correctors. (April 22nd.)

METROPOLITAN ASYLUMS BOARD.—May 18th. Installation of a multiple roller ironing machine; new steam boiler, &c.; steam main; electric power in laundry, &c., at Darenth Tramway Colony; conversion of mechanical stokers to hand firing at North-Eastern Fever Hospital. (April 29th.)

LONDON COUNTY COUNCIL.—May 17th. Electrical installation at the Albion Road, Stoke Newington, Central School (approx. 133 points). (May 6th.)

Manchester.—May 30th. Electricity Department. L.p. valves for circulating water system, two electrically-driven and one steam-driven boiler feed pumps. (See this issue.)

New Zealand.—WELLINGTON.—June 21st. Public Works Department. Sub-station switchgear and metering equipment for Arapuni. (B.X. 3398.)*

AUCKLAND.—July 4th. Auckland Electric Power Board. Switchgear. (B.X. 3471.)*

Richmond-on-Thames.—May 23rd. Municipal Water Department. Electrically-driven centrifugal pump, with motor, &c. Mr. H. P. Williamson, engineer, Riverside.

Scarborough.—June 3rd. Corporation. Installation of electrical pumping plant in duplicate for the new Irton water scheme No. 2. Specifications (£5) from Dr. H. Lapworth, engineer, 25, Victoria Street, S.W.

Sleaford.—May 17th. Electricity Department. Cables, boxes, &c. (April 29th.)

Stirling.—May 27th. Corporation. Electrical work at 96 houses. Specifications from Mr. Andrew H. Goudie, burgh surveyor.

Thorne.—May 17th. West Riding Education Committee. Electric lighting installation at new boys' school. Specifications, &c., from Education Department, County Hall, Wakefield.

Tynemouth.—June 11th. Electricity Department. One voltage regulating transformer. (See this issue.)

Whitley.—Electricity Department. One 1,000-kW turbo-alternator, with condenser, pumps, air filter, &c.; one 200-kW semi-Diesel or heavy-oil engine alternator. (May 6th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Australia.—MELBOURNE.—Electricity Supply Committee. Accepted :—

D.c. switchgear (£4,246).—Johnson & Phillips, Ltd.

H.p. armour-clad switchgear (£5,277).—A. Reyrolle & Co., Ltd.

Electrically-driven pump (£1,425).—Kelly & Lewis.

7,400 yd. triple braided cables (£932).—British Insulated Cables, Ltd.

POSTMASTER-GENERAL'S DEPARTMENT.—Primary battery material (£977).—Siemens Aust. Pty., Ltd.; (£26,862) Widdis Diamond Dry Cells, Ltd.

Accumulator plates and separators (£645).—T. K. Steanes and Son; (£924), Chloride Elec. Storage Co., Ltd.; (£1,341), Tudor Accumulator Co., Ltd.

Motor-generator sets (£232).—Crompton & Co., Ltd.

Automatic exchange equipment for Brisbane Central and Paddington Exchanges, Queensland (£161,105).—Siemens (Aust.), Ltd.

STATE ELECTRICITY COMMISSION OF VICTORIA.—555-kVA transformers (£971).—Weymouth's, Ltd.

V.I.R. control cables (£1,278).—British Insulated Cables, Ltd.

SYDNEY.—New South Wales Railways.
H.p. cable (£17,903).—Enfield Cable Works (Aust.), Ltd.

Electricity Supply Committee. Recommended:—
Copper busbars (£450), two 2-ton electrically-operated jib cranes (£754 each), one 3-ton ditto (£937), one 5-ton ditto (£1,577).—Noyes Bros. (Sydney), Ltd.
14¼ tons corrosion-resisting bars and fittings for Bunnerong (£406).—Armco Australian Agency.
3¼ tons bare copper cable (£390).—W. T. Henley's Telegraph Works Co., Ltd.

Finance Committee. Accepted:—
5,000 metal filament lamps (£312).—Condor Lamps (Aust.), Ltd.

Tenders.

Ayrshire.—Education Authority. Accepted:—
Electric lighting work at new primary school at Irvine (£107).—C. Banks (Irvine).

Belgium.—International competition was again experienced at Schaerbeek, Belgium, on April 29th, when the municipal authorities opened tenders for the supply of 11,000 metres of h. and l.p. armoured cable. Offers were received from Belgian, German, Dutch, French, Czecho-Slovakian, and British firms. The quotations ranged from 429,670 fr. to 616,885 fr., the lowest being that of the Land-und-See Kabelwerk Gesellschaft, of Cologne, this being 3,650 fr. under the lowest Belgian quotation. The British competing firms were Callender's Cable and Construction Co., Ltd., who quoted 564,800 fr., and British Insulated Cables, Ltd., whose price was 585,882 fr.

Canterbury.—Town Council. Accepted:—
Equipment for a central sub-station:—
E.h.p. cables, control, telephone and pilot wires (£2,322).—Standard Telephones & Cables, Ltd.
Switchgear (£460).—Ferguson, Pailin, Ltd.
Overhead travelling crane (£164).—Herbert Morris, Ltd.

Dartford.—Urban Council. Accepted:—
Supplying and laying cables from the electricity works to Park Road (£1,952).—Power Lines Construction Co., Ltd.

Doncaster.—Town Council. Accepted:—
Two 500-kVA transformers (£700).—Bruce Peebles & Co., Ltd.
E.h.p. switchgear (£500).—Ferguson, Pailin, Ltd.

Hitchin.—Rural Council. Accepted:—
Installing electric light at 26 houses at Knebworth (£7 10s. each).—Stevenage Electric Light and Power Co.

Hull.—Education Committee. Accepted:—
Electric light installation Park Avenue Special School (£376).—Alexander Shaw & Sons.
Tramways Committee.
Renewal of tram track in Newland Avenue (£5,598).—Sangwin, Ltd. (Recommended.)
Telephones Committee.
Instruments.—Automatic Telephone Manufacturing Co., Ltd. (£475), W. F. Dennis & Co. (foreign) (£337). (Accepted.)

Liverpool. — Electricity and Tramways Committee. Accepted:—
70 tons tiebars (£700), 20 tons fishbolts (£220).—Société Anonyme Usines & Aciéries.
20 miles e.h.p. cable (£44,320).—British Insulated Cables, Ltd.
10 miles e.h.p. cable (£21,780).—W. T. Henley's Telegraph Works Co., Ltd.
Maintenance of electric lifts at electricity and tramways offices for three years.—Express Lift Co., Ltd.

London. — LONDON COUNTY COUNCIL. — Highways Committee. Accepted:—
Tramway stores:—
Controller segments, fingers, tips, &c.—Dyer & Young, Ltd.; Higgs & Hill, Ltd.; E. Showell & Sons, Ltd.; Yorkshire Switchgear and Engineering Co., Ltd.
Gear wheels and pinions.—Metropolitan-Vickers Electrical Co., Ltd.; Cammell, Laird & Co., Ltd.; Power Plant Co., Ltd.
Rheostats.—Rheostatic Co., Ltd.

WIMBLEDON.—Electricity Committee. Accepted:—
Twelve 100-kVA transformers (£1,026).—Hackbridge Electric Construction Co., Ltd.

SOUTHWARK.—Electricity Committee. Accepted:—
Meters.—Chamberlain & Hookham, Ltd.
Brush holders.—J. Child & Co., Ltd.
Steel pipes.—Millwall Engineering Co., Ltd.
Stoneware ducts.—Sutton & Co., Ltd.

GENERAL POST OFFICE.
Telephone switchboard lamps.—Edison Swan Electric Co., Ltd.

Maidenhead.—Town Council. Accepted:—
Wiring houses at Cox Green for electric lighting (£4 17s. 3d. each).—W. H. Arundell & Co.

Oldham.—Electricity Committee. Accepted:—
Earthenware cable ducts.—Albion Clay Co., Ltd.
Overhead electric travelling crane for new power station.—Clyde Crane & Engineering Co.

Manchester.—Tramways Committee. Accepted:—
Trolley wire.—Messrs. Richard Johnson & Nephew, Ltd.
Two Millars concrete mixers.—Millars Machinery Co., Ltd.
Block tin.—French & Smith, Ltd.

Paving Committee. Accepted:—
Electrical work at new depot.—Meta Manufacturing Co., Ltd.
Motor and starter frame for driving machinery at depot.—Metropolitan-Vickers Electrical Co., Ltd.

Electricity Committee. Accepted:—
Static transformers.—Bruce Peebles & Co., Ltd.
Feeder cables.—Callender's Cable & Construction Co., Ltd.

Education Committee. Accepted:—
Electric cooker at Cheetham Central School.—R. H. Clampnett & Co.

Ross-shire.—LOCH LUICHART.—Ross-shire Electric Supply Co., Ltd.
Supply and erection of pipes, water turbines, and electrical plant for the station at the outlet of Loch Luichart.—James Gordon & Co.

The plant will consist of two 750-h.p. Francis turbines, coupled to two 500-kW generators, with switchgear, transformers and about 40 miles of transmission line.

South Africa. — CAPETOWN. — South African Milling Co.
Wiring contract, the new flour mills.—Gearings, Ltd., of Cape Town. The contract comprises wiring for 20 motors (4 being of 130 h.p. each) and for over 500 lighting points.

Electricity Supply Commission. Accepted:—
Wiring the new power station at Salt River Mouth, near Cape Town (£2,550).—Edward A. Shaw & Co., Cape Town.

Walsall.—Town Council. Accepted:—
Modification of the existing switchgear at the station, including the provision of 10 new switches (£5,866).—A. Reyrolle & Co., Ltd.

Warwick.—Board of Guardians. Accepted:—
Installing electric light in the new children's block, &c. (£242).—Ellis & Ward, Ltd.

Watford.—Electricity Committee. Accepted:—
Cable.—W. T. Henley's Telegraph Works Co., Ltd.

Worthing.—Town Council. Accepted:—
L.p. distribution cables (£6,498).—Enfield Cable Works, Ltd.

Forthcoming Events.

Physical Society.—Friday, May 13th. Imperial College of Science, South Kensington, S.W. 5 p.m. Ordinary meeting.

Association of Mining Electrical Engineers (South Wales Branch).—Saturday, May 14th. South Wales Institute of Engineers, Cardiff. 6 p.m. Annual meeting.

(North of England Branch).—Saturday, May 21st. Annual general meeting.

Röntgen Society.—Tuesday, May 17th. 32, Welbeck Street, W.1. 8.15 p.m. Ordinary meeting.

Institution of Electrical Engineers (Wireless Section).—Wednesday, May 18th. London. 6 p.m. "A Wireless Works Laboratory." Mr. P. K. Turner.

Royal Society of Arts.—Wednesday, May 18th. 8 p.m. "Industrial Welfare in Great Britain and the United States." Mr. R. R. Hyde.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the name and address of makers of the following:—

SILOVAC vacuum cleaner.
ROBERTSHAW vacuum cleaner.
MARVEL electric curling iron.

Notes.

Sir Charles Soame, Bt., and Co-Directors Charged.

At the Mansion House, before Ald. Sir G. Truscott, on May 10th, Sir Charles Buckworth Herne Soame, Bt., Edward Warden, Robert George Harley, and Col. Edmund Octavius Eaton were summoned at the instance of the City Police on charges of conspiracy to defraud such persons as might receive prospectuses, &c., relating to the Chalk Fuel Power Gas and By-Products Corporation, Ltd.; to obtain money from them by representing that the statements made regarding the fuel were genuine reports; and to commit offences against the Larceny Act, 1861 (Section 84). A letter from Sir Charles Soame was read, explaining that he was unable to attend by reason of an accident, in 1924, which had crippled him. It was also stated that Col. Eaton was too ill to appear. The hearing was accordingly adjourned for six weeks.

Irish Free State Electricity Supply.

At a meeting of the Irish Centre of the Institution of Electrical Engineers on April 28th, in Dublin, a paper was read by Mr. MacEntee on the subject of "Rural Distribution of Electricity in the Irish Free State," in the course of which he said that the comparative scarcity of the rural population, coupled with the fact that it lived more or less in isolated homesteads, would considerably influence the rural distribution system of electricity. The network in connection with the hydro-electric development of the Shannon would be so extensive and so close-knit that a considerable number of towns within a distance of from 10 to 15 miles of each other would become the terminal points of 10,000-volt lines. In Ireland they had embarked upon an undertaking very large in proportion to their resources—one which might cripple the State if it failed, but, if it succeeded, would bring returns in prosperity and in social amelioration more than commensurate with the risk. One of the essentials was the successful application of electricity to the conditions of rural life, and experimental rural lines should be immediately constructed, so that fundamental data necessary for a sound scheme for electrification of rural areas might be secured.

The Free State Government's Bill for the absorption of local electrical undertakings under the Board of Control in connection with the Shannon hydro-electric scheme is now before the Senate at last, and passed second reading after an amendment proposed by Sir John Keane in favour of delay had been rejected. This amendment urged that the House should refuse a second reading to the Bill until "it is satisfied that the Executive Council (Cabinet) is unable to lease the Shannon works at a rent to cover interest and sinking fund on the capital cost." Several Senators complained that, in view of the dissolution of the Dail (Lower House) this month and the approach of a General Election for members of that Chamber, it would be impossible to have a definite discussion in Committee, whereupon Mr. McGilligan, Minister of Industry and Commerce, announced that, if necessary, the election could be postponed, as the Government was determined to get the Bill through without delay. The policy of the Government is the subject of keen hostile criticism by various speakers in the election campaign throughout the country, but Ministers and their friends continue to defend it and to plead that a Bill for the control of the whole electricity supply of the State is essential to the success of the Shannon scheme and the distribution of cheap power through an efficient service. A party of members of the Institution of Civil Engineers in Ireland was this week to have paid a visit of inspection to the Shannon works.

Electric Threshing Demonstration.

To demonstrate the possibilities of electricity on the farm, the Chester Corporation Electricity Department, in conjunction with Messrs. Ransomes, Sims & Jefferies, Ltd., arranged a demonstration of threshing machinery at Deeside Farm, Sealand, recently. The experiment was witnessed by farmers from various parts of the country. Threshing was done under the direction of Mr. F. Ayton. The Class "AM" medium threshing machine and a 25-b.h.p. electric motor, mounted on a portable carriage for removal from place to place by a horse, were employed.

The British Association.

Preliminary details of the 97th annual meeting of the British Association for the Advancement of Science have been issued. The meeting is to be held at Leeds from August 31st to September 7th under the presidency of Prof. Sir Arthur Keith, M.D., LL.D., F.R.S. Prof. Sir J. B. Henderson is to be president of the Engineering Section, Prof. D. H. MacGregor president of the Economics Section, and Prof. E. T. Whittaker, F.R.S., president of the Mathematical and Physical Science Section.

Electric Ship Propulsion.

The Peninsular and Oriental Steam Navigation Co. has placed a contract with Messrs. Alexander Stephen & Sons, Ltd., Linthouse, Glasgow, for a passenger liner of 19,000 tons, which will be the largest vessel of the liner type fitted with electrical gear; she will be over 600 feet in length and the turbines will obtain steam from Yarrow water-tube boilers working at a pressure of 375 lb. per square inch. The transmission of power from the turbines to the propeller shaft will be electrical and the speed of the ship will be 19 knots. Accommodation will be provided for 400 first-class and 300 second-class passengers. Another "electric" ship is being built at Scott's Yard, Greenock, for the Holt line.

Electric Vehicles in Italy.

It is reported from Rome that among the efforts that are being made to render Italy less dependent on imported motor fuel is a campaign by the Italian Automobile Club to popularise the greater use of electric vehicles. In this connection it is reported that a new type of secondary battery has been developed by Count Gallenga, which is considerably lighter than those at present available.

River Water—or Cooling Towers?

In a recent communication to the Société des Ingénieurs Civils, Mr. T. J. Guéritte touched upon the above question, and in the *Génie Civil* of April 9th he developed the subject with reference to the article by Mr. J. N. Waite, M.I.E.E., published in the ELECTRICAL REVIEW of January 14th, and the correspondence which ensued. Accepting Mr. Waite's figure of 4 per cent. for the relative advantage of using river water, in place of the 7 per cent. formerly claimed, the author further points out that the peak load only lasts a few hours, and at other times the average temperature of the circulating water is lower. Where cooling towers are installed, if the ponds are designed so as to profit by the lowering of temperature and the reduction of load during the night, the increased consumption of steam due to the use of towers instead of river water takes place only during a very short time. In addition, the cost of screening the river water and pumping it to the station, and the high cost of foundations for a station built on the bank of a river, tend to annul the economy due to using river water. Recently some important stations which could have been sited on rivers have been built on land nearer the centres of distribution. On the other hand, the necessity of softening make-up water for cooling towers must often be allowed for, though this is partially off-set by the cleaner and more efficient condition of the condensers.

Unless highly efficient cooling towers are employed, however, the 4 per cent. loss may rise to 10 per cent. or more. Recent developments are in the direction of hyperbolic towers, especially in England, as at Liverpool. The Corporation of Birmingham is going to build 20 enormous towers, each having an output of 21,000 tons of water per hour, the power station being projected for an ultimate capacity of 840,000 kW.

In his communication to the Society, Mr. Guéritte examined the efficiency of natural-draught coolers, and showed that a wide range of cooling was not essential. On the contrary, it was desirable to have a rapid circulation of water, between relatively narrow temperature limits, but ensuring as low a temperature as possible at the condenser inlet. He explained why wood and steel construction had been dropped, and why the circular form had been adopted, and stated that large coolers were the most economical; a cooler 40 m. in diameter was as effective as four of 20 m. diameter, and far cheaper, but in very large cylinders it was difficult to ventilate the central portion. Hence the hyperbolic type of Messrs. Van Iterson and Kuypers was invented, which had no projections from the shell, so that the air circulated freely and uniform temperature was obtained over the whole surface of any horizontal section.

Appointments Vacant.

Head of the Electrical Engineering Department (£500) for the Robert Gordon's Colleges, Aberdeen. Showroom attendant (70s.) for the Borough of Stoke Newington Electricity Department. Junior scientific assistant for the Admiralty Research Department. Electrical engineer and general manager (£1,500) for the Corporation of Belfast. Lecturer in electrical engineering for the Borough Road Polytechnic. Salesman (84s.) for the Farnworth Urban District Council electricity undertaking. Junior mains records assistant for the Croydon Corporation Electricity Department. Mains engineer for the Corporation of Lowestoft. Plumber-jointer for the Eccles Corporation Electricity Works. Telegraph foreman (£400) for the Government of Nigeria. Assistant telephone engineer for the Oriental Telephone and Electric Co., Ltd. (See our advertisement pages to-day.)

H.P. Electrode Steam Generators.

In a recently-issued bulletin of Messrs. Oerlikon, Ltd., a description is given of electric steam generators which have been introduced. They are designed for working pressures from 3,000 to 8,000 V and for outputs ranging from 300 to 5,000 kW. These h.p. electrode steam generators, like the l.p. Oerlikon equipments, are provided with fixed electrodes, the output being regulated by varying the level of water. The electrodes are separated by insulated bodies arranged in an iron frame fitted in the boiler; they are secured to the cover and can be removed by raising the latter. Tests on a 1,200-kW electrode boiler for 6,400 volts have shown, it is claimed, that the efficiency of this plant can reach 98 per cent. An equipment of this capacity has been in service for some time at one of the

hospitals of the city of Basle; it is designed for 1,200 kW at 6,000 V. The plant works in conjunction with a steam accumulator with a storage capacity of 2,500 kW-hours, which can feed the different parts of the hospital when the electrode boiler is not in operation. The hot water also required is heated in a separate counter-flow apparatus by means of the steam generated in the electrode boiler and stored in large tanks. The generators were built by the Oerlikon Co. in conjunction with Messrs. Escher, Wyss & Co., of Zurich.

The First European 380-kV Transmission Line.

What is stated to be the first 380-kV electricity transmission line in Europe has recently been completed between Neuenahr and Rheinau by the Rhenish-Westphalian Electric Power Works Co., to connect its steam-operated and hydro-electric power stations. Actually there are two lines about 125 miles in length, each consisting of three hollow copper cables 42 mm. in diameter, supported on masts about 110 ft. high and spaced at intervals of approximately 328 yards. A noteworthy feature is the section of the line across the River Rhine near Coblenz, a single span of 547 yards. Fig. 1 illustrates the construction of the hollow cable, which was developed by the Allgemeine Elektricitäts Gesellschaft, of Berlin, in conjunction with the R.W.E.; it has a cross section equivalent to 400 sq. mm., as against 1,000 sq. mm. for a solid conductor, and it consists of a large number of flat wires arranged in two layers over a central support. The latter, which the A.E.G. has patented, consists of a spiral-shaped flat-copper band wound edgeways on a mandril, which is removed when the spiral is completed; the two layers over the spiral, which run in opposite directions and are wound in the usual manner on a tandem stranding machine, consist of flat hard-drawn copper wires of segmental section, *i.e.*, in the form of a trapezium, by which means the various wires are forcibly supported in their relative positions; the latter effect is augmented by increasing the thickness of the wires of the inner layer, the principal function of the weaker outer layer being to keep the structure together. For the erection of the line new methods and special equipment were necessary in order to protect the cable from undue stresses during the stretching and erection operations. Fig. 2 represents one of the towers with the platforms temporarily fitted up for the cable-erection operations and the wheels over which the cables were pulled by means of a winch. During the erection the cable was maintained taut by means of a tension-regulating device specially constructed for the purpose. It is claimed that the manufacture of hollow cables does not present any difficulties, provided the material is good and the dimensions of the spiral and layer wires are appropriately chosen.

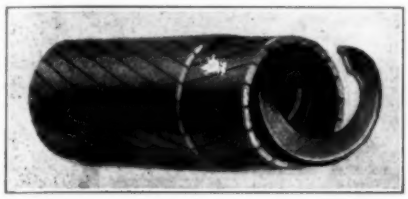


Fig. 1.—A.E.G. Hollow Copper Cable.

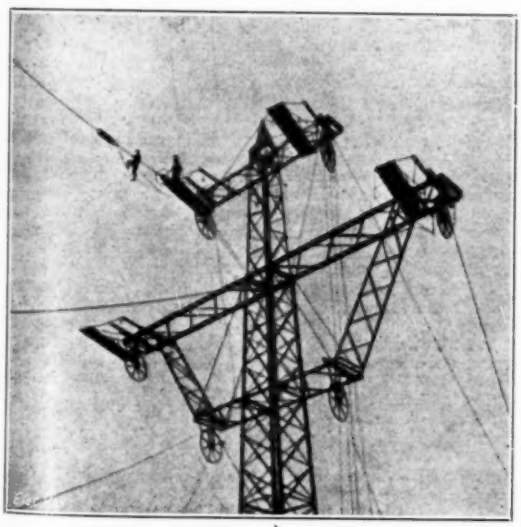


Fig. 2.—Tower with Erection Platforms and Wheels.

How to Reduce Electricity Prices.

The *Daily Express* reports that taxpayers at Grasse on the Riviera seized the town hall as a protest against the high cost of electricity, gas, and funerals.

Street Accidents Caused by Vehicles.

The returns for 1926 show that in Great Britain there were 96,742 accidents caused by mechanically propelled vehicles, of which 7,426 were due to omnibuses and motor coaches, and 5,697 due to tramcars and railless trolley vehicles. The total number of accidents was 124,287; 4,886 persons were killed and 133,888 injured. In the Metropolitan Police District there were 43,507 accidents, and 1,003 persons were killed.

Association of Supervising Electrical Engineers.

The results of the fifth annual competition for the W. E. Highfield Shield, 1927, have been announced. The winner of the shield and first prize, value 4 guineas, presented by the Board of Control, is Mr. G. H. Conway, for a paper on "Electrically-heated Glasshouses"; second prize, value 2 guineas, presented by Messrs. V. G. Middleton & Co., Ltd., Mr. B. C. Garman, for some "Notes on Electric Cooking Apparatus"; and third prize, value 1 guinea, presented by Messrs. Johnson & Phillips, Ltd., Mr. E. J. Davies, for a paper on "Electricity as Applied to the Asphalte Industry." The winning Associate competitors are:—First prize, value 2 guineas, Messrs. Hogan & Wardrop, Mr. T. V. Harding, "Electric Crane Control"; and second prize, value 1 guinea, editor of *Electricity*, Mr. F. Anderson, for a paper on the "Testing of Electrical Machines."

Educational.

RESEARCH SCHOLARSHIPS.—A limited number of research scholarships in technology (each of a value not exceeding £100) will be awarded in July, 1927, tenable during the academic year 1927-28 in the Manchester Municipal College of Technology (Faculty of Technology in the University of Manchester). The subjects include electrical engineering and electro-chemistry. Applications must be received on or before July 6th, 1927; forms of application may be obtained by written application to the Registrar of the College.

The Armourers and Brasiers Company has arranged for lectures to be delivered at the Sir John Cass Technical Institute, 31, Jewry Street, Aldgate, E., at 6.30 p.m., on May 17th and 31st, and June 14th, by Dr. W. H. Hatfield, on "Special Steels and their Application in Engineering," and at the Royal School of Mines, Prince Consort Road, South Kensington, S.W., on May 18th and 25th and June 1st, by Mr. U. R. Evans, on "Oxidation, Corrosion, and Passivity of Metals." Admission is free, without ticket. The company has also founded Industrial Bursaries to assist honours graduates and students to pursue their studies. (See our advertisement pages to-day.)

Rating Electricity Undertakings.

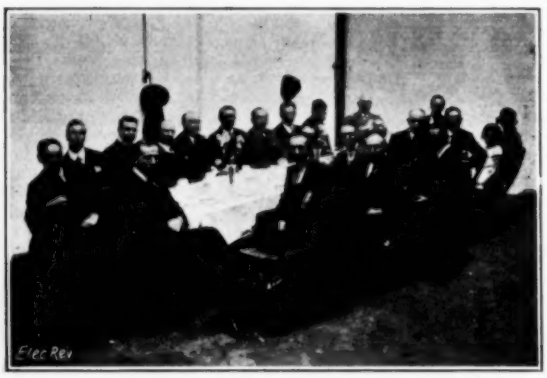
The Local Government Committee of the L.C.C. recommends in connection with the report of the Advisory Committee on Domestic Supplies appointed by the Electricity Commissioners, that representations should be made by the Council on the subject of the recommendation of the Advisory Committee dealing with assessment for rating, which is as follows:—"With regard to assessment for local rating, the Committee are of opinion that the present method of assessing electricity supply undertakings requires immediate amendment. The Committee recommend that electricity undertakings should be assessed on the basis of the profits of the undertakings, with a rebate of such a sum as would represent 75 per cent. of the sum payable on account of the general district rate in respect of underground cables and works." The Local Government Committee points out that no arguments are adduced in the report in justification of the proposed rebate, but that it is probably based on the precedent of section 211 (1) (b) of the Public Health Act, 1875, which provides that certain classes of property shall be assessed to the general district rate at one-fourth only of their net annual value. By the Rating and Valuation Act, 1925, the general district rate is abolished as a separate rate, but the effect of the exemption is continued by reducing the value on which rates will be levied by an amount representing the average amount of the relief from the general district rate over the period from 1914-1924. There is, however, very little, if any, analogy between underground cables and the classes of property dealt with. On the other hand, there is a close analogy between electric cables and water and gas mains. The assessments of water and gas undertakings are based on profits in the same way as electricity undertakings, no exemption being allowed in respect of their mains. There is frequently active competition between gas and electricity undertakings, and it would be manifestly unfair to impose on gas undertakings additional rates in order to relieve their competitors. If partial exemption were granted to electric cables, it would be difficult to refuse it to gas mains or other similar classes of property. During the committee stage of the Rating and Valuation Bill an amendment was moved to grant an exemption (similar to that enjoyed by railways) in respect of the underground mains and pipes of gas, water and electricity undertakings, and of the rails, tracks, &c., of tramways. This amendment was, however, withdrawn, on the representation of the Minister of Health. The Royal Commission on Local Taxation reported in 1901 against the extension of exemptions. In this connection the Council passed a resolution to the effect that no further exemptions from rating should be allowed, and that existing exemptions should be abolished as opportunity offered. It is true that the recommendation of the Advisory Committee relates only to general district rate purposes and does not affect London; but if the rebate were conceded outside London, it might be difficult to resist the application for a similar rebate in London.

The Thury D.C. System in France.

For the past twenty years a power transmission line on the Thury high-voltage, direct-current, variable-voltage system has been in operation between Moutiers and Lyons, France, for the supply of power for the tramway system in the last-named city. The system has worked well, the only difficulty encountered having been that of the supervision of the line between Chambery and Novalaise, a distance of nearly 20 miles, where an altitude of 3,290 ft. is attained and the weather is very severe, especially in winter. To overcome this drawback the Société Générale de Force et Lumière recently decided to install a new underground cable on this section of the line, placing a contract with the Compagnie Générale des Cables, of Paris, for a d.c. cable capable of working at 150 000 volts and of attaining 300,000 volts between the positive and negative wires with the central point earthed. It is claimed that this constitutes a new step forward in cable manufacture, the highest d.c. voltage transmission hitherto attained in France being 60,000 V.

Chief Technical Assistants' Association.

On May 7th a party of members of this Association paid a visit to the Ilford Electricity Department's sub-stations. At Gant's Hill sub-station the automatic gear was inspected and operated for the benefit of the visitors. The next stop was the Goodmayes sub-station, where some more automatic equipment was seen in operation. Mr. G. F. Gregory (Ilford) presided at tea at the sub-station, supported by Mr. A. Murdoch (Fulham), the chairman of the Association. The party is seen in the accompanying illustration. After inspecting the showroom a number of the members visited the Stepney Electrical Exhibition.



The C.T.A.A. at Ilford.

Carnegie Grant for X-Ray Martyr.

An allowance of £120 per year has been made by the trustees of the Carnegie Hero Fund to Dr. G. C. W. Williams in recognition of his X-ray work. Dr. Williams has been compelled to give up his professional work as the result of the loss of his right hand and part of his left. He had carried on X-ray work since 1895, and much of it was of a valuable nature.

Electro-Farming Discussed in Paris.

Last week the Société Française des Electriciens devoted a long evening to the subject of the "Applications of Electricity to Agriculture." Papers illustrated by kinematograph films were presented by Mr. R. Borlase Matthews, who dealt with the British point of view; Dr. A. Ekström, who illustrated Swedish practice; and M. Bitouzet, who referred to the electric ploughing work now being carried out in the rural districts within a radius of 40 miles of Paris. A part of the film shown by Mr. Matthews was entirely new, and has not yet been exhibited in England; it demonstrated the application of electric light and heat for the treatment of bees, showing the results of experiments conducted during the past three years at East Grinstead. The result of such treatment is that the bees are kept free from disease and produce considerably more honey per hive per annum. The feature of Dr. Ekström's paper was the fact that in Sweden it was now more profitable to supply a rural area than an urban one. M. Bitouzet's film was a revelation as to the serious progress that was being made in electric ploughing in France.

Radiation.

Mr. John B. Kramer, of the General Electric Co., Ltd., who has been investigating phenomena associated with radio-active energy, described some of the interesting results he has achieved in a lecture on "Radiation" before the Birmingham Electric Club recently. He showed how it is possible to harness, in a small way, the energy of certain radio-active materials, which exist in quantities in various parts of the world. In his early experiments, Mr. Kramer had used monazite sand from India as a source of radiation, and batteries were made by placing the sand between plates of carbon and zinc; the sand remained radio-active for years, but it was eventually found to be unsuitable owing to changes in the atmosphere setting up an electrolytic action. Other materials, notably thorium, had since been used. Mr. Kramer demonstrated various experiments, and claimed that they had brought him nearer to the practical utilisation of the energy stored in radio-active minerals. He showed a method of using radiation energy to work a small electronic balance, and also an electronic cell; the radio-active substance was placed upon a carbon plate, above which, with an air space between, was a zinc plate. He was engaged in examining such cells with a view to developing a battery which would produce sufficient energy for useful work, even if only in a small way for a start. He pointed out that, up to a certain point, the determination of the air gap in an electronic cell, a very important matter, was contrary to Ohm's law, in that the charge increased as the gap was made larger; this was probably explained by the fact that a certain volume of air was required for maximum ionisation.

Boiler Explosion Report.

A report has been issued of the preliminary inquiry into the cause of an explosion which occurred from a water-tube boiler at the Lister Drive power station, Liverpool. One of the tubes failed longitudinally over a length of 7 in., and at each end of the opening it ruptured circumferentially, creating an aperture 7¾ in. wide. The explosion was caused by overheating due to excessive scale deposit on the inside surface of the tube. There appears to have been no thinning of the tube as in ordinary cases of over-heating.

The Electro-Deposition of Rubber.

According to *Science*, the electric rubber moulding process was worked out by two groups of research workers, one in America and one in Hungary, neither of which knew that the other was engaged in the problem. The American workers were S. E. Sheppard and L. W. Eberlin, of the Eastman Kodak Company, and the Hungarian group was led by Paul Klein and A. Szegvari. Both groups knew that when solid dried crude rubber was worked upon a mixing mill in the rubber factory the rubber substance was made softer and weaker. They knew that the less rubber was heated or worked, the better was its quality; they also knew that research in recent years had shown how vulcanisation might be carried on at lower temperatures than formerly and the necessary sulphur combined with rubber with the minimum loss of quality. Certain substances known as "accelerators" possess the property of permitting vulcanisation to be accomplished at relatively low temperatures. However, if these accelerators were incorporated on the usual mixing mill, the temperature would be sufficiently high to cause vulcanisation during mixing and to spoil the goods.

These men conceived the plan of so depositing rubber on forms, from latex, that the rubber particle itself was not altered, and made the discovery that electro-deposited rubber had the highest quality ever observed. There were many problems to be solved before this was made practical. It was necessary for other substances to be deposited simultaneously, such as sulphur, zinc oxide, and carbon black; the last two substances are required to give toughness. A long investigation was carried out to find means to disperse them in water, mixed with the latex particles, without coagulating the latex. A noteworthy achievement was the discovery of means by which the rubber layers might be free from bubbles—by surrounding the anode with a porous clay diaphragm. The anode is therefore immersed in electrolyte inside a porous clay cell or dish, and the rubber particles, together with those of zinc oxide, sulphur, &c., are deposited upon this porous diaphragm. The rubber as it collects forms a continuous homogeneous tough covering of uniform thickness. Any thickness up to an inch or more is practicable. Rubber thus formed is stronger than rubber prepared by the old methods, and is free from gas or air holes. Industrial development is already well advanced. The continuous, automatic production of certain kinds of articles is feasible. Insulation for wires and other things electrical is another application. No high temperatures are used. Previous reference to the subject was made in the ELECTRICAL REVIEW of January 28th, p. 155.

Electrical Association for Women.

On March 24th some members of the Electrical Association for Women, Birmingham and Midlands Branch, paid a visit to the General Post Office, Birmingham, where they viewed the engine room, rotaries and generators, and had explained to them the intricacies of the telephone, telegraph, and postal sections. On April 14th three American films, brought over by Mrs. C. Frederick and kindly loaned by Mr. J. W. Beauchamp, director E.D.A., were shown to the Association by the Gaumont Co. in its private theatre. These were much appreciated, as they gave the English woman an idea of how the American woman achieves her leisure by means of electricity. On Thursday, April 28th, a demonstration of the Hoover suction cleaner and heater was given by the manager of the Birmingham Branch of the Hoover Co. at Ridgway's Café, Birmingham.

A sixth branch, North-East Coast, has been added to the Association; the inauguration meeting was held at the Lighting Service Bureau, Dial House, Newcastle, on April 28th. Viscountess Grey of Fallodon was elected president, and Miss A. Holm hon. secretary and treasurer.

Service Note.

The eighth Royal Air Force Display will take place on Saturday, July 2nd, at Hendon Aerodrome. The programme has been arranged to demonstrate the efficiency and airmanship of service squadrons, and new features are being introduced which will enable the public to appreciate the developments that are constantly taking place in the air arm. Arrangements have been made to improve accommodation and traffic facilities at the aerodrome. The proceeds will be devoted to Royal Air Force charities.

Institution of Railway Signal Engineers.

The proceedings, 1926-27, of the above Institution, are now available (7s. 6d. to non-members). The papers read during the session, together with the discussions and authors' replies, are included in the contents, among which are: "A Comparative Survey of American and British Signalling," by J. Parsons; "Fundamentals of Automatic Telephone Switching," by H. H. Harrison; "Electrical Power for Railway Signalling Communications," by M. G. Tweedie; and "Railway Signalling in Germany," by T. S. Lacelles. It is hoped that it will be possible to view at least three large recent signalling installations in France during the summer meeting this year, which is expected to be held from June 17th to 21st.

Institution Notes.

Institution of Electrical Engineers.

WESTERN CENTRE.—The following officers have been nominated for the 1927-28 session:—*Chairman*: C. G. Morley *New*; *second vice-chairman*: S. B. Haslam; *new members of committee, south of the Bristol Channel (four vacancies)*: R. D. Archibald, A. F. Coates, L. A. Hards, F. G. Jones, and J. W. Spark; *north of the Bristol Channel (one vacancy)*: G. D. Arden, J. M. Bowman, H. O. Davies, and P. J. Plevin.

LONDON STUDENTS' SECTION.—During the 1926-27 session 11 meetings have been held, the average attendance being 63, as against 104 last year. The record attendance was 160 at the joint meeting of the London Students' Sections of the Institutions of Civil, Mechanical and Electrical Engineers. The Committee is, however, not satisfied with this low average attendance of 4.1 per cent., the number of members attending the discussion being nearly always less than those present when the paper is read, and the quality of papers was not up to the usual standard. The number of visits during the session was 13, the average attendance being 86. The social functions held during the year have been fewer than last year. The summer meeting of the Students' Sections was held in Belgium and Luxemburg.

Royal Institution.

The annual meeting of the members was held on May 2nd, Sir Arthur Keith, treasurer and vice-president in the chair. The annual report of the Committee of Visitors was read and adopted, and the report of the Davy-Faraday Research Laboratory Committee was also read. Sixty-four new members were elected in 1926, and 78 lectures and 19 evening discourses were delivered. The following members were unanimously elected as officers for the ensuing year:—*President*: The Duke of Northumberland. *Treasurer*: Sir Arthur Keith. *Secretary*: Sir Robert Robertson.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. J. W. BURLEIGH, chief electrical engineer at Newton's Dynamo Works, Taunton, has resigned in consequence of ill-health, and sails with his family on May 21st for California. His association with the Dynamo Works dates from 1900. The staff on May 4th presented Mr. Burleigh with a silver cigarette casket as a farewell gift.

We learn that Mr. JOHNSTONE WRIGHT'S appointment is under the Central Electricity Board, not the Electricity Commission of Great Britain as stated in our last issue.

We regret to learn that Mr. STANLEY J. HARDING is resigning his position as managing editor of the *British Engineers' Export Journal* owing to the deterioration of his eyesight consequent upon ill-health. Mr. Harding was with the *Electrical Times* for many years, and he has edited the *Export Journal* for the past eight years. He hopes to be able to resume his activities after a period of rest.

Capt. H. LEIGH MOSSLEY has been appointed chairman of the Willesden Electricity Committee.

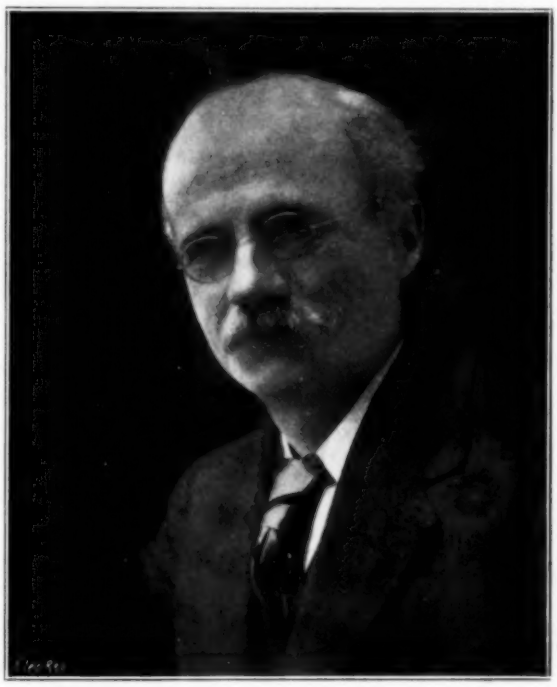
Mr. A. W. MAKOVSKI (Messrs. Tamplin & Makovski, Ltd.) has been re-elected president of the Reigate and Redhill Chamber of Commerce.

M. MARS, general secretary of the Compagnie Française pour l'Exploitation des Procédés Thomson-Houston, Paris, has been appointed a Chevalier of the Legion of Honour.

On May 4th, Mr. H. A. RATCLIFF, who has relinquished the position of deputy chief engineer to the Manchester Corporation Electricity Department to become chief electrical engineer to the London Power Co. (under the engineer-in-chief, Dr. S. L. Pearce), was presented by his colleagues with a set of silver-ware. Mr. Ratcliff has also received a gold cigarette case from his colleagues at the Polygon testing station.

Mr. A. L. LUNN, who is the hon. secretary of the North-Western Centre of the I.E.E., succeeds Mr. Ratcliff as deputy chief engineer at Manchester, and the following new appointments have been made:—Mr. T. BAXENDALE, superintendent of power stations; Mr. W. DUNDAS, resident engineer, Barton station; Mr. F. P. SEAGER, resident engineer, City station; Mr. J. L. CARR, B.Sc., chief electrotechnical engineer; Mr. J. D. PEATTIE, B.Sc., electrotechnical engineer; Mr. A. PHILIP, B.Sc., assistant superintendent of testing section.

Mr. W. A. SHAW, of Stockport, the president-elect of the E.C.A. Allied Associations, whose portrait appears herewith, commenced business as an electrical contractor in 1886, and was joined two years later by his brother, who was his partner for 10 years, afterwards going to Capetown, where he is still in business as an electrical contractor. In the early years of his business career the work carried out by Mr. Shaw was principally private lighting installations in mills, &c., with a large amount of business in private telephone installations,



Elliott & Fry] [*London.*

Mr. W. A. Shaw,
President-elect of the E.C.A. Allied Associations.

for public authorities such as the Lancashire County Police, Liverpool Corporation (Vyrnwy and Rivington Waterworks), and others. The firm were pioneers in street fire alarm work, and put in the system for Stockport and many other towns in Lancashire and Cheshire. Of late years the work has principally been lighting and power, and the maintenance of the telephone systems before mentioned. Mr. Shaw has been a member of the E.C.A. since the earliest days of the Association, and has taken an active part in its work, principally in development. He was elected first chairman of the Development Committee, and still holds that office.

The *Manchester Guardian* reports the retirement of Mr. HENRY ELLIOTT from the position of Post Office telephone contract manager for the Manchester district. Mr. Elliott joined the National Telephone Co. in 1891. He has been presented with a gold cigarette case by his colleagues.

Mr. J. H. BUTTERS, who relinquished the position of chief engineer to the Tasmanian Government Hydro-Electric Department to become chief commissioner at Canberra, was knighted upon the occasion of the inauguration of the new Federal Parliament at Canberra.

The Accrington Town Council has referred back a proposed increase in the salary of the electrical engineer (Mr. A. W. CLEGG). His remuneration is: Salary £700, bonus £166. The energy sold last year amounted to 15,500,000 kWh. The Electricity Committee now asks the Council to agree to a remuneration of £700, bonus £213, and to institute a sliding scale for increased sales of energy to bring the salary and bonus to £991 when 20 million kWh is sold.

To-morrow, May 14th, Mr. H. TOPLEY, A.M.I.E.E., is leaving the position of charge engineer at Doncaster Corporation electricity works, to take up a similar appointment at the power station of the United Alkali Co., Ltd., Widnes.

Alderman A. G. ELLAWAY (Birmingham) has been elected chairman of District Joint Industrial Council No. 5 for the Electricity Supply Industry (West Midlands Area). Mr. R. F. DEMPSTER (A.E.U.) is vice-chairman. Mr. E. J. JENNINGS, who has been secretary and treasurer since the formation of the Council, has been re-elected to the position.

Mr. W. A. RHIND, late of the English Electric Co., Ltd., and Messrs. Siemens Bros. & Co., Ltd., has joined the Empire Rubber Co., of 25, Victoria Street, S.W.1, where he will deal with business in rubber as applied to the electrical industry.

We regret to note from our contemporary, the *South African Mining and Engineering Journal* for April 16th, that Mr. JOHN ROBERTS, the Durban borough electrical engineer, was seriously indisposed. He was expected to leave Durban for a time for complete rest and change. "His second in command, Mr. E. Poole, will be acting borough electrical engineer in the meantime."

Obituary.—MR. H. HARTNELL.—We record with regret the death of Mr. Henry Hartnell, A.M.I.E.E., a retired staff engineer to the General Post Office, which occurred on May 3rd, at Wellington, Somerset, at the age of 81 years. In the course of his lengthy service at the Post Office he was for many years examiner in technology. He possessed a special knowledge of electric cable matters, including loaded submarine and underground cable, and his committee work included duties as a member of the Committee on Copper Conductors, and as a member of the Engineering Standards Sub-Committee on Telegraphs and Telephones. For some years he was joint editor of the *Journal* of the Institution of Post Office Electrical Engineers, and he was an accomplished translator of technical and scientific matter from many languages. He had a considerable knowledge of languages, both ancient and modern. Mr. Hartnell was in many respects a remarkable man; of great technical ability, he was at an early period selected for transference from the telegraph staff at the Nottingham Post Office to the engineer-in-chief's office in London under Sir W. H. Preece, where he had many opportunities of showing his sterling worth in every branch of the service. Those who had the privilege of his acquaintance were warmly attached to him and delighted to renew their acquaintance on every opportunity. As a worker he was indefatigable, and kept in harness almost to the last.

MR. A. V. BURTONSHAW.—The death took place on March 29th of Mr. Arthur V. Burtonshaw, who was for 16 years electrical engineer to the late Mr. Albert Brassey, at Heythrop, Oxon.

MR. W. E. BEER.—We have great regret in recording the sudden death of Mr. W. E. Beer, B.Sc., D.I.C., at the very early age of 28 years. Mr. Beer, who was an assistant in the Electricity Department of the National Physical Laboratory, where he was held in high esteem, was on his way to the laboratory on the morning of April 27th when he succumbed to an attack of hæmorrhage. He had published several original scientific papers, and was a member of B.E.S.A. and other committees.

Will.—MR E. BREMNER SMITH, chairman of the Oswestry Electric Lighting and Power Co., Ltd., left £13,848 gross and £8,464 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Peters & Co., Ltd.—Private company. Registered May 2nd. Capital, £1,500 in £1 shares. Objects: To acquire the business of an electrical factor now carried on by Amy L. Peters, at 5, York Road, Colwyn Bay, as "Peters & Co.," and to carry on the business of electrical engineers, manufacturers of and dealers in all electrical appliances and apparatus and wireless instruments and accessories, &c. The subscribers (each with one share) are:—H. Peters, Hill Croft, Church Road, Rhos-on-Sea, electrical factor; H. V. Lee, Hazelhurst, Church Road, Rhos-on-Sea, commercial traveller. H. Peters shall be permanent governing director and chairman, so long as he holds £250 shares. Qualification of directors: £25 shares. Secretary: R. Roberts, 13, Erskine Road, Colwyn Bay. Solicitor: D. Thomas, Post Office Chambers, Colwyn Bay.

Sherrion-Goodridge Patents, Ltd.—Private company. Registered, May 5th. Capital, £100 in 1s. shares. Objects: To adopt an agreement with P. Sherrin and H. C. Goodridge, and to carry on the business of electrical and mechanical engineers, manufacturers, and repairers of thermionic devices and parts, and instruments for the production of alternating currents, vacuum measuring instruments, vessels and lamps, scientific glass blowers, manufacturers of and dealers in electrical, mechanical, telegraphic, telephonic, television, and other appliances and apparatus, &c. The subscribers (each with one share) are:—E. C. Goman, 44, Leghorn Road, Harlesden, electrical engineer; A. Secretan, 44, Montgomery Road, W.4, clerk. Secretary: F. B. Weller. Registered office: 64, Mill Hill Road, Acton, W.3.

Buell Combustion Co., Ltd.—Public company. Registered, May 4th. Nominal capital: £250,000 in £1 shares. Objects: To acquire (1) from the Buell Pulverised Coal Syndicate, Ltd., and Bolton & Partners, Ltd., certain inventions relating to the systems of combustion or burning of pulverised fuel known as the "Buell System," (2) from United Water Softeners, Ltd., and Kek, Ltd., certain inventions relating to systems of grinding and crushing or disintegrating known as the "Kek Mill," and (3) from the British Columbia and West Canadian Agency, Ltd., and W.A.C. Pulverisers, Ltd., certain inventions relating to the systems of pulverisation and disintegrating known as the W.A.C. Pulverisers, and to carry on the business of iron and brass founders, mechanical and electrical engineers, &c. The directors are:—C. A. Polton, Littleworth Lodge, Esher (director, G. T. Holloway & Co., Ltd.); W. I. Anderson, British Empire Club, St. James', S.W. (director, British Columbia and West Canadian Agency, Ltd.); L. A. Neel, 38, Drayton Court, Drayton Gardens, S. Kensington, S.W. (director, United Water Softeners, Ltd.); H. A. Procter, 48, Queen's Drive, West Derby, Liverpool (director, Buell Pulverised Coal Syndicate, Ltd.); N. Liversidge, Oxley Woodhouse, Huddersfield (director, Jas. Watkinson & Son, Ltd.); J. G. Robertson, Drayton Gardens, S. Kensington, S.W.10 (engineer, Babcock & Wilcox, Ltd.). Qualification: £500 shares or stock. Solicitors: Herbert Smith & Co., 62, London Wall, E.C.2.

Official Returns of Electrical Companies.

Mann, Egerton & Co., Ltd.—Equitable mortgage dated April 12th, 1927, to secure £10,000, charged on certain properties in Marylebone. Holders: Armstrong Siddeley Motors, Ltd., Parkside, Coventry. Collateral mortgage dated December 2nd, 1912, securing £3,000, being part of a sum not exceeding £10,000 secured by debenture dated October 3rd, 1912, was satisfied to the extent of the first-named sum on January 28th, 1920. (Notice filed April 26th, 1927.)

Newcastle-upon-Tyne Electric Supply Co., Ltd.—Acknowledgement of further indebtedness dated April 8th, 1927 (supplemental to trust deed dated October 16th, 1913), to secure £430,000 additional second mortgage debenture stock, ranking *pari passu* with £1,546,000 like debenture stock. Trustees: Law Debenture Corporation, Ltd., 24, Old Broad Street, E.C.

C.A.C. Valve Distributing Co., Ltd.—Debenture dated April 7th, 1927, to secure £250, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: V. J. Woolley, Sherrington School of Physiology, St. Thomas's Hospital, S.E.

Charles Mickleburgh, Ltd.—Particulars filed on April 17th of £1,000 debentures authorised February 17th, 1927, charged on the company's undertaking and property, present and future, the whole amount being now issued.

North-Western Wireless Company and Wallasey Motor Exchange, Ltd.—Debenture dated April 12th, 1927, to secure £500, charged on the company's property, present and future, including uncalled capital. Holder: D. Greenwood, 5, Ashburton Road, Wallasey.

Electrical and Allied Instrument Manufacturing Co., Ltd.—G. C. McEwen, of 35, Copthall Avenue, E.C.2, and S. R. McDonald, of "Elstan," The Mall, Surbiton, ceased to act as receivers or managers on February 28th, 1927. (Notice filed April 25th.)

Acme Production Co., Ltd.—T. G. Weavers, of 4, Drapers Gardens, E.C.2, ceased to act as receiver or manager on April 20th, 1927.

India Rubber, Gutta Percha and Telegraph Works Co., Ltd.—Capital, £1,250,000 in 750,000 ordinary, 250,000 preferred, and 250,000 unissued shares of £1 each. Return dated December 9th, 1926. 750,000 ordinary and 250,000 preferred shares taken up. £1,000,000 paid. Mortages and charges: £400,000.

South Metropolitan Electric Tramways and Lighting Co., Ltd.—Capital, £400,000 in 200,000 ordinary and 200,000 preferred shares of £1 each. Return dated March 16th, 1927. All shares taken up. £365,110 paid on 165,110 ordinary and 200,000 preferred shares. £34,890 considered as paid on 34,890 ordinary shares. Mortgages and charges: £128,791.

Rhayader Electric Light and Power Co., Ltd.—Capital, £2,000 in £5 shares. Return dated November 4th, 1926. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Electric Light Insurance and Maintenance Co., Ltd.—Capital, £5,000 in £1 shares. Return dated October 1st (filed December 24th), 1926. 1,255 shares taken up. £1,257 10s. paid (including £2 10s. paid on 50 shares forfeited.) Mortgages and charges: £1,567 14s.

Poynter, Griffiths & Co., Ltd.—Return dated December 31st, 1926 (filed February 2nd, 1927). Capital at date of return, £6,000 in £1 shares (increased March 4th, 1927, to £20,000 in £1 shares). 6,000 shares taken up. £4,500 paid. £1,500 considered as paid. Mortages and charges: £1,746.

Baynton's Wholesale Wireless, Ltd.—Capital, £2,500 in £1 shares. Return dated March 12th, 1926 (filed March 25th, 1927). All shares taken up. £2 paid, £2,498 considered as paid. Mortgages and charges, nil.

John Lewis (Wireless), Ltd.—Capital, £100 in £1 shares. Return dated March 7th, 1927. All shares taken up. £100 paid. Mortgages and charges, nil.

Wholesale Electric Lamp Co., Ltd.—Capital, £1,500 in £1 shares. Return dated December 31st, 1926 (filed March 11th, 1927). 425 shares taken up. £425 paid. Mortgages and charges, nil.

City Notes.

Johnson & Phillips, Ltd.

The annual meeting was held on May 8th, Sir Philip Dawson presiding in the absence of the chairman (Mr. C. Johnson). In moving the adoption of the report (ELEC. REV., April 29th, p. 691), the chairman read a statement prepared by Mr. Johnson, in which he said that the profit for the year, after making provision for bad and doubtful debts, and after charging to revenue some £15,000 odd for maintenance of buildings, plant, &c., amounted to £115,114. Referring to the balance sheet, the chairman said that a further £94,000 had been expended on additions to the property. It was always necessary in a business like theirs to keep on spending money on capital account in order to keep pace with the latest developments. The total assets exceeded the liabilities by just over £1,000,000. Investments at £136,649 were somewhat less than appeared in the last balance sheet, and included a £50,000 8 per cent. mortgage debenture in Burndept Wireless, Ltd. The directors were of opinion that the debenture was amply covered by the assets of that company. Burndept's were very good customers of the company, which in the past had done a profitable business with them. The falling-off in the profits as compared with the previous year was caused entirely by the general strike and the prolonged coal stoppage. The value of the orders booked from the beginning of May until the end of October was rather less than 50 per cent. of the amount booked during the corresponding six months of 1925. As a matter of fact, the disastrous month of May was so bad that they only booked one-third the value of orders compared with the correaponding month in the previous year. Due to the same unfortunate industrial conditions, they experienced considerable difficulty in obtaining certain raw materials, and the general conditions which prevailed rendered the task of maintaining output very costly. The results obtained, therefore, must be considered satisfactory in the circumstances, and reflected the highest credit on the management, staff, and workers. Notwithstanding the industrial upheavals which occurred during the past year, the relations between their workpeople and the management continued to be of the most cordial nature. During the last few days of November, after the settlement of the coal dispute, they booked so much work that the total value of orders taken that month created a record—exceeding the previous record by nearly 100 per cent. Among the more important orders in hand at the present time was the large extension order for the Southern Railway Company, comprising some 78 miles of h.p. cable. Having the benefit of the large additions made to the factory during the last year or so, they were able to undertake the manufacture of the whole of that cable themselves, whereas of the previous order, which was for 125 miles, they had to sublet part of the actual cable manufacture to other cable makers. The success of this great railway electrification scheme, as indicated by the rapid extension of which this repeat order formed part, was an encouraging augury for the electrical industry as a whole. With regard to their own position, he might fairly summarise it by saying that they had weathered a peculiarly difficult year without having sustained too serious a setback. He did not wish to underrate the difficulties which might lie ahead of them. Competition was still very keen, both at home and abroad, and the British manufacturer had to stand up to it everywhere unsheltered. But they had tremendous assets in their thoroughly up-to-date equipment, their world-wide selling organisation, their skilled personnel, and, above all, their reputation, extending over half a century, for manufactures of the very highest quality. They were engaged in an industry for whose products the world's needs were enormous, incalculable, and cumulative, so that no question of a saturation limit could arise. Our own country's electrical underdevelopment was such as to constitute a vast reserve of demand. The Electricity Act was now on the Statute Book with the express object of remedying that under-development. The transition stage must involve some delays, perhaps even a temporary lull in demand, but as to the ultimate effect all round, there could be no doubt, and as the products of the company, cables, transmission lines, transformers and switchgear, formed the very spearhead of electrical progress, the lines along which all electrical advance must be made, concerns such as theirs must be the first to feel the benefit of the new impetus to the industry. Mr. J. MacGregor, the managing director, in seconding the motion, remarked that they had started the new year very well, and it looked as if labour had settled down to an earnest desire to work steadily and get back their losses. Replying to questions, Mr. Macgregor said that they were members of the Cable Makers' Association, and as far as it had worked, it was a very fair system indeed, both to those who were in it and to their customers. Shareholders need have no anxiety about the £50,000 debenture which the company held in the Burndept Company. It was fully secured, and their monthly accounts from that company were being paid promptly. The report was adopted.

Shropshire, Worcestershire and Staffordshire Electric Power Co.

The accounts of this company for 1926 were reviewed in our issue of April 29th, p. 690. The annual meeting was held on May 3rd, when Mr. E. Garcke, who presided, pointed to the satisfactory improvement in the revenue in face of the industrial dislocation last year. He said that although the great industries in the Midlands had not yet fully recovered, applications from new customers of all classes were being received in considerable numbers. Dealing with the development of business, the chairman repeated the statements in the report relating to the Avon Valley Order and the acquisition of the Ludlow undertaking, and also said that arrangements had been made to take over the electricity supply assets of the Bishop's Castle Electric Light and Power Co. and the Fladbury Electric Light and Power Co., two unauthorised undertakings working in the company's area. The Stourport station had been completed, and during the current year would probably be able to carry a large proportion of the Smethwick load and some part of the Redditch load. The linking-up of the company's system with that of Birmingham was almost finished; by that means the undertakings could furnish reciprocal supplies. The company had pursued its policy of providing electricity in some of the less densely populated districts, and an encouraging demand had been received from some of the smaller towns and villages on the route of the power lines. During the past year 85 miles of mains had been installed and extensions of the distribution network had been carried out in such places as Bromsgrove, Evesham, Astwood Bank, and Stourport, which were formerly considered rural but were becoming industrial. Mr. Garcke expressed the company's confidence in the Central Electricity Board, and concluded with a statement regarding a change in the company's name. The directors had proposed "The Severn Electric Power Company," but were open to other suggestions.

Calcutta Electric Supply Corporation, Ltd.

The annual meeting was held on May 4th, Lord Meston (chairman) presiding. In presenting the report (which we reviewed in our last issue, p. 730), the chairman said that the issue of 150,000 ordinary and 150,000 preference shares during the year had enabled them to add £97,500 to the capital reserve. The redemption of the first mortgage debentures had been completed and the balance of the sinking fund had been transferred to general reserve, and the result was a very healthy balance-sheet. The work done on the new station at

the Calcutta Docks had added nearly half-a-million sterling to their fixed assets. One generator at the station was working before the end of the year and two others had since been brought into use, and the company now had an ample reserve of plant. Riots and industrial disturbances had adversely affected the company's business during the year, but the economy effected in running costs had caused a slight improvement in the net profit. The past year had been marked by a good deal of activity: the duties of the staff were reorganised; the distribution system was improved; plans for replacing overhead cables by underground mains were matured; an efficient a.c. fan was designed; they took over the electricity supply of Dum-Dum; and the company's licence for operating in Howrah was renewed on satisfactory terms. The new station now had three 6,000-kW sets, and another similar set was being installed; the station was planned for eventual extension to 100,000 kW. The company had decided to decrease its charges and hoped that the extended use of electricity would compensate them. The unfailing support of the shareholders had enabled the company to build up large reserves, and the directors accordingly proposed to capitalise a part of those reserves and distribute it as ordinary shares in the proportion of one to each ten held at present; that would mean the creation of 136,000 shares. The prospects appeared to be encouraging. Maj.-Gen. R. H. Mahon seconded the adoption of the report, and it was approved. Subsequently a resolution providing for the capitalisation of part of the reserve was passed.

Cornwall Power Co., Ltd.

Mr. P. D. Tuckett (chairman) presided at the annual meeting on May 5th. In presenting the report, the chairman said that the company was formed last year to facilitate the financing of the Cornwall Electric Power Co. (the Parliamentary Company). The accounts were therefore very simple, consisting substantially of two items: A holding of shares and debenture stock of the Parliamentary Company on one side against the issued shares of the limited company on the other; at the date of the balance-sheet those items stood at £221,322 and £250,000 respectively. Their holding in the Parliamentary Company represented the whole of its issued share capital and all but £5,960 of its issued debenture stock. Their own capital consisted of 150,000 partly-paid convertible preference shares and 212,500 fully-paid ordinary shares held by the Urban Electric Supply Co. There was a balance of £12,367, from which they proposed to pay the 7 per cent. preference dividend and 5 per cent. on the ordinary shares. When the preference shares were fully paid, the holding in the Parliamentary Company, and consequently the income, would be increased. Referring to the operations of the Parliamentary Company, Mr. Tuckett said that, in spite of the industrial position, its gross profit had increased. £17,000 was put to the reserve, raising it to £121,000—over 60 per cent. of the issued capital. The power station was being extended to meet the demands from the tin mines.

Marconi International Marine Communication Co., Ltd.

Mr. F. G. Kellaway (deputy-chairman and managing director) presided at the annual meeting on May 5th, and at the commencement of his speech said that since the date of the report Col. Simpson had resigned from the board. Dealing with the report and accounts (ELEC. REV., April 29th, p. 690), the chairman said that the progress of profits in the past four years must give the shareholders a sense of security. The sum of £230,316 in the balance-sheet, representing investments in subsidiary companies, included the cost of acquiring a majority of the shares in the Radio Communication Co., Ltd., and the whole of the shares in the Brazilian Marconi Co. The sum of £24,051 for shares in associated companies included the amount involved in the purchase of shares in the Canadian Marconi Co. and Amalgamated Wireless (Australasia), Ltd. The company was in a strong financial position, and at December 31st last the gilt-edged securities stood at £511,795, and £66,000 of War Loan had since been purchased. The company's prospects had been considerably enhanced by the acquisition of a controlling interest in the Radio Communication Co., the company's principal competitor. Dealing with the improvement in the shipbuilding industry, Mr. Kellaway said that in the first three months of the current year the company had done 66 per cent. of the total amount of new business for the whole of last year.

New Issues.

County of London Electric Supply Co., Ltd.—The company's offer of £4,250,000 of 5 per cent. debenture stock at £96 per cent. was several times over-subscribed by 11 a.m. on the day of issue (May 4th).

Buenos Aires Lacroze Light and Power Co., Ltd.—On Monday last the public were offered £300,000 of 6½ per cent. redeemable mortgage debenture stock of this company at 96½ per cent. The principal and interest are guaranteed by the Buenos Aires Central Railway. The company was formed *inter alia* for the supply of electricity to this railway company and the Buenos Aires Lacroze Tramways Co., and these two undertakings have agreed to purchase from the company an annual minimum of 30 million kWh each while any portion of the debenture stock is outstanding. The proceeds of the issue will be mainly employed in the erection of an 18,000-h.p. generating station and an agreement for the execution of this work has been entered into with Balfour, Beatty & Co., Ltd. The list was closed, for London, at 10.45 a.m. on the day of issue.

Electrical Finance and Securities Co., Ltd.—This company has a controlling interest in the Colne Valley Electric Supply Co., Ltd., the Northwood Electric Light and Power Co., Ltd., the Foots Cray Electricity Supply Co., Ltd., the Lothians Electric Power Co., and the Boston and District Electric Supply Co., Ltd. It was formed for the purpose of financing electricity undertakings, the securing of provisional orders for supply, &c. This week an issue was made of £100,000 5½ per cent. debenture stock, at £92 10s. per cent., and 100,000 7 per cent. preference shares of £1 each at par. The 1926 profits were sufficient to cover the service of the debentures more than three times, and to twice cover the preference dividend after deducting debenture interest, &c. The proceeds of the issue are to be used for the redemption of the existing debentures (£20,000), and loans (£154,000), and for the general purposes of the company. The issue was quickly over-subscribed.

Electric Supply Corporation, Ltd.—The directors have offered to existing shareholders 50,000 £1 ordinary shares at 30s. each to provide funds for the further development of the company's business.

Calcutta Tramways Co., Ltd.

Mr. J. G. B. Stone (chairman) presided at the annual meeting on May 3rd. After reviewing the financial results of the past year (*vide* ELECTRICAL REVIEW, April 29th, p. 691), he said that the period had been a troubled one on account of the communal riots, but they could now look forward to more normal conditions. Although they still had to meet a considerable amount of omnibus competition, there had been a material reduction in the number of their competitors. They had added to their own fleet of 'buses, and further additions were projected, to act mainly as feeders to the tramways. Fares had been reduced, with a resultant benefit in increased traffic; the company was endeavouring to attract the poorer class in Calcutta which did not at present use the cars. He (the chairman) was convinced that tramways were the best means of dealing with the transport of the mass of the population of Calcutta. The board was proceeding with the appointment of a traffic advisory committee consisting of representatives of the company, the Calcutta Corporation, the Commissioner of Police, the Calcutta Improvement Trust, and the Howrah Municipality. The report and accounts were adopted.

Ever-Ready Co. (Great Britain), Ltd.

The report for the year ended March 31st last shows a profit of £174,588, to which is added £23,864 brought forward, making £198,452. The reserve accounts receive £29,514, and after allowing for the interim dividends, there is a balance of £129,058, with which it is proposed to deal as follows:—Final preference dividend; final dividend of 25 per cent. on the old ordinary shares, making 35 per cent. for the year; dividend of 25 per cent. on the new ordinary shares; carried forward, £26,558. The directors again report a considerable expansion in the company's business; this was contributed to by the subsidiary undertakings and overseas branches. The profit shows an increase of £35,100. During the year, plant and works extensions involved an expenditure of £66,000, and since the close of the year a further expenditure of £20,000 has been undertaken. The 71,200 ordinary shares offered to the shareholders at 50s. each in November last were fully taken up, and the premium of £106,800 has been transferred to general reserve. Meeting: May 31st.

Stock Exchange Notices.

The undermentioned have been ordered to be officially quoted:—

Atlas Light and Power Company.—1,500,000 ordinary shares of £1 each, fully paid, Nos. 925,212 to 2,425,211; and 1,000,000 seven per cent. preference shares (cumulative) of £1 each, fully paid, Nos. 1,000,001 to 2,000,000.

Midland Electric Corporation for Power Distribution.—70,000 ordinary shares of £1 each, fully paid, Nos. 280,001 to 350,000.

North Metropolitan Power Station Company.—£850,000 five per cent. guaranteed debenture stock, 1957.

Dealings in the following have been specially allowed by the Committee under Rule 159:—

Baird Television Development Co.—100,000 10 per cent. preferred participating ordinary shares of £1 each, partly paid and fully paid, Nos. 1 to 100,000; 100,000 deferred ordinary shares of 1s. each, fully paid, Nos. 1 to 100,000.

County of London Electric Supply Co.—£4,250,000 5 per cent. debenture stock, issued at 96 per cent., partly paid and fully paid.

Craigpark Cable Co., Ltd.

As reported in our last issue, the ordinary dividend for 1926 is 7½ per cent., as against 12½ per cent. for the previous year. The directors state that the company's business was seriously affected by the coal stoppage, and the relatively unsatisfactory results were caused by this to a considerable extent. In addition, the company has spent money in necessary alterations and improvements in the workshops and increasing its selling organisation, which has brought no results so far on account of the prevailing industrial conditions.

Scottish General Transport Co., Ltd.

The revenue for 1926 was about £2,000 higher at £30,793. The balance brought forward is £11,345, making £42,138. After meeting all expenses and allocating £22,847 to renewals, it is proposed to carry forward the balance (£4,789). No dividends were received on the company's holding of ordinary shares in the Greenock and Port Glasgow Tramways Co. and the Rothesay Tramways Co. This and the effects of the coal stoppage combined to reduce the company's available balance.

Stratford-on-Avon Electricity Co., Ltd.

At the recent annual meeting, the directors reported a net profit of £2,727, to which was added £409 brought forward, making £3,136. A dividend of 5 per cent. was declared on the ordinary shares, £1,500 put to general reserve, and £665 carried forward.

Ross Electric Light and Power Co., Ltd.

The gross profit for 1926 was £959, and the net loss has been reduced to £6,657. Arrangements have been made for an a.c. supply from Hereford in place of the d.c. supply; this is expected to reduce costs.

Fairbairn Lawson Combe Barbour, Ltd.

The directors report a net loss of £123,571 for 1926. Against this is set a balance of £87,739 brought forward, reducing the loss to £35,832. No dividend is paid on the preference or ordinary shares.

Pernambuco Tramways and Power Co., Ltd.

From the profits of the past year the directors propose to place £8,000 to reserve (against £7,000), to pay the dividend on the 7 per cent. participating preference shares, and to carry forward £5,644.

Mexican Light and Power Co., Ltd.

A meeting of the holders of the company's 5 per cent. second mortgage bonds is to be held on May 24th, to give approval to the scheme for dealing with arrears of interest and dividends outlined in our last issue.

Brush Electrical Engineering Co., Ltd.

The dividend on the ordinary shares for 1926 is again 10 per cent. Under the company's co-partnership scheme £7,354 is to be distributed among the staff and employés.

Glenfield & Kennedy, Ltd.

The directors have declared a final dividend of 6 per cent., making 10 per cent. for the year as for 1925-26.

Melbourne Electric Supply Co., Ltd.

An interim dividend of 10 per cent., free of tax, has been declared on the ordinary shares, as in 1926.

Radio Corporation of America.

The gross income for the quarter ended March 31st was $10,572,490, and the surplus profit amounted to $126,788.

Coventry Chain Co., Ltd.

The directors have declared an interim dividend of 2 per cent., as against 3 per cent. last year.

French Companies.

The *Société des Accumulateurs du Nord* reports a net profit of 250,000 fr. for 1926, which has been placed to the reserve fund.

The *Société Gramme* proposes to repeat the dividend of 60 fr. per share out of net profits of 623,000 fr. for 1926.

The *Compagnie des Locations Electriques* records net profits of 799,000 fr. for 1926, as compared with 743,000 fr. in the previous year, when a dividend at the rate of 7 fr. per share was declared.

The *Compagnie Générale Electrique* has decided to carry forward the net profit of 463,000 fr.

The *Compagnie Electro-Mécanique* reports an available surplus of 4,944,000 fr., of which 4,610,00 fr. has been devoted to depreciation and the balance carried forward.

The *Compagnie d'Entreprises Electro-Mécanique* reports orders for the construction of sub-stations for the Orleans Railway Company, a dam above the Coindre station for the utilisation of the Upper Dordogne and two hydro-electric works in the province of Segovia, Spain. The accounts show a net profit of 579,000 fr., which sum has been applied to depreciation.

Norwegian Company.

The report of the *A.S. Elektrisk Bureau* states that 1926 was a still more difficult year than 1925, as a result of the appreciation of the krone and the stagnation in business, while the level of wages did not keep pace with the declining prices of manufactures. The turnover amounted to 4,700,000 kr.; the sales of telephone material reached 1,790,000 kr., or 700,000 kr. less than in 1925. The accounts show a deficiency of 300,000 kr., which is extinguished by appropriations from the reserve funds.

North Metropolitan Electric Power Supply Co.

The company offers the holders of its 8 per cent. second preference stock (which is under notice of redemption) the right to exchange their holdings, on July 1st, into 6 per cent. cumulative preference shares at par.

Swedish Company.

The *Svenska Accumulator A.B. Jungner* reports net profits and balance forward, amounting to 230,000 kr. for 1926, permitting of the payment of 8 per cent. on the ordinary shares, as compared with 7 per cent.

Belgian Company.

The *Société Internationale d'Energie Hydro-Electrique*, Brussels, has made an issue of 50,000 preference shares in Amsterdam at the price of 196 guilders per share.

Siemens Bros. & Co., Ltd.

The directors have declared a final ordinary dividend of 5 per cent., making 7½ per cent. for 1926, as for 1924 and 1925.

Stocks and Shares.

MONDAY EVENING.

INVESTMENT has taken the bit between its teeth, now that money conditions are regarded as being favourable to all sound stocks and shares. Prices are rising in nearly every section of the more serious markets, leaving speculation behind in the matter of public popularity. The prompt closing of the County of London Electric Supply Company's subscription lists for so large an amount of stock as 4½ million pounds of 5 per cent. debenture at 96 is clear illustration of the general appetite for a first-class security offered at a reasonable figure. Reduction in the Bank rate to 4 per cent. is considered to be sufficiently probable as to justify advance discounting of the anticipated change. The cable group shows a number of rises. The chief gain in our lists to-day is one of 8 points in British Electric Traction preference. Mexican Light and Power preferred follows with an advance of 7.

Immediate success attended upon the offer by the Electrical Finance and Securities Company of £100,000 5½ per cent. debenture stock at 92½ and 100,000 7 per cent. cumulative preference shares of £1 each at par. Originally, in 1914, a few weeks before the outbreak of war, the company was incorporated with an authorised capital of £50,000 in £1 ordinary shares. Later, an issue was made of £20,000 in 10 per cent. debentures. These are to be repaid in July this year. The company's assets comprise interests in the Colne Valley Electric Supply, the Northwood Electric Light and Power, Foot's Cray Electricity Supply, Lothian Electric Power, and the Boston and District Electric Supply Companies. Two of the three directors are also on the board of British Insulated Cables, Ltd. The 5½ per cent. debenture stock has a reasonable margin of cover, and should prove a good investment. The preference shares carry an element of speculation. For both issues the public promptly oversubscribed.

Another new issue that went very well is £300,000 Buenos Aires Lacroze Light and Power 7½ per cent. sterling redeemable mortgage debenture stock at 96½. The company was formed for constructing, equipping, and operating an electricity generating station in Buenos Aires to supply, primarily, the B.A. Central and the B.A. Lacroze Tramways, these two companies undertaking to purchase sufficient energy annually to ensure the interest and sinking fund of the debenture issue now offered. The principal, sinking fund and interest are guaranteed unconditionally by the B.A. Central Railway, and the security is very fair. The County of London Electric Supply allotments will be dealt in this week. A premium was an assured certainty from the day that the lists closed so promptly.

In the demand for investment stocks of all kinds, it seems reasonable to expect that the London electricity supply shares are not likely to remain unmoved. Reference to our table will show that from 5¼ to over 5½ per cent. is obtainable from the ordinary shares of the Brompton, Charing Cross, Chelsea, Kensington, London, St. James', South London, and Westminster shares, the calculations being based on the 7 per cent. dividends that will come into force at the end of 1931. Meanwhile, the return on the money is higher, in consequence of reasons too often mentioned here to require reiteration. People are on the look out for good shares that pay anything like 6 per cent. on the money, and, in spite of the objection which attaches to a fall in dividend in four years' time, the knowledge that the 7 per cent. laid down by Act of Parliament can be maintained with ease, and that there is a possibility of this being exceeded, will serve to bring into prominence such purely investment shares as those mentioned. When money rates are high, the attraction becomes less noticeable, but, seeing that the Government recognises the national importance of reducing money rates in order that interest and other charges can be lowered in successive Budgets, it is justifiable to look for money conditions to be easy over a period of years. There will be spasms of tightness, no doubt, but, looking at the matter broadly, the investor who is content to take 5¼ or 5½ per cent. on his money need have no qualms about keeping his present holding

of London electricity supply shares, or of adding to it when opportunity serves.

The Home Railway market is quiet, and there is nothing fresh to report in any of the Underground issues, all of which hold the gains which they secured last week. Current traffics now run against those of the strike, a year ago. It must be repeated that the public show little inclination to buy Home Railway stocks, but the Undergrounds are in a different position from that occupied by the steam railways, and the prospects of the District are hopeful enough to warrant appreciation from a present price which still pays over 5½ per cent. on the money.

The Electric Supply Corporation offers its proprietors 50,000 shares at 30s. each. As the existing shares stand at 32s., and as the company is likely to continue its 10 per cent. dividend payments, shareholders may be advised to take advantage of this offer for increasing their interests. In the manufacturing group, the tendency is somewhat dull. Johnson & Phillips are unchanged at 47s. 6d. Sir Philip Dawson read an optimistic speech by the chairman, Mr. Claude Johnson, at the recent meeting, Mr. Johnson being unfortunately indisposed and unable, by his doctor's orders, to take the chair. The managing director stated that "the only financial interest of Johnson and Phillips in Burndept Wireless is a mortgage debenture for £50,000 and a current account for supplies that is paid month by month." He referred to the drop in the Stock Exchange price of the shares as being a purely market phenomenon over which the company had no control.

Mexican utility issues are very much to the fore, in consequence of the publication of the scheme for dealing with the Mexican Light & Power arrears. The overdue dividend on the 7 per cent. cumulative preference shares is to be funded by the allotment as fully-paid, to the registered holders of the shares, of a new 4 per cent. cumulative redeemable second preference share. It is proposed to convert the ordinary share capital into shares of no par value. The directors are of opinion that, should no unforeseen events occur, the company's earnings will be sufficient to pay the dividends on the 7 per cent. preferred, the new 4 per cent. second preference, and to leave something over. This has had a marked effect upon prices. Mexican Light & Power preferred at 115 are 10 points up. The 5 per cent. first bonds at 72½ have gained 4 points. Mexico Trams rose 3 to 30½, and the 5 per cent. first bonds at 79¼ are 4½ up on the week. Mexican Electric Light fives advanced to 67½, and the whole of the group shows pronounced strength, due primarily to the Mexican Light & Power statement, which comes up to the most optimistic expectations that had been formed in advance.

The cable group is good, thanks to the investment enquiries which are going on all round the markets. Rises have occurred in Easterns, Globes, Westerns, Anglo-Americans, Great Northerns, and Indo-Europeans, amongst others. United River Plates keep firm at 9. Venezuela Telephones are a little better at 34s. 3d.

Marconis are quiet, the ordinary shares at 17s. 6d. and Marines at 23s. 9d. The Marconi Company has secured an important contract in Bolivia whereby the company will undertake the control and operation of the entire postal, telegraph and wireless service of that country. This is an arrangement somewhat similar to that already in force between Marconi's and the Peruvian Government. Canadian Marconi's gave way a little to 4s. sellers. We understand that a meeting is to be held in the near future, possibly this week, at which information will be given of the progress which the Canadian company is now making. Automatic Telephones remain a dull market at 46s. 3d. Three new automatic telephone exchanges are expected to be ready towards the end of this year, and it is said that the first will be opened in five months' time.

Calcutta Electric Trams are £2 ex rights, which, making allowance for deduction of the value of the new shares, is a little better on balance. At last week's meeting, the Chairman referred to the loss of traffic occasioned by last year's communal riots in India. A complete absence of pilgrims and of the usual influx of holiday-makers into Calcutta, during the Punjab holidays in October, was due to the same cause. Anglo-Argentine Tramways are again a little higher. There has been a noticeable demand for the company's 5 per cent. debenture stock. British Columbia Railways remain firm. Fewer fireworks have been seen in Brazilian Traction, Barcelona, and Sidro shares, but no reactions have occurred in the advanced range of prices.

British Electric Traction preference rose 8 points on the assumption that the proposed scheme will be adopted whereby the stock is to receive 8 per cent. dividend for last year. The directors proposed, it may be recalled, to convert the present ordinary stock into an 8 per cent. non-cumulative preferred ordinary, and to distribute new deferred ordinary stock by way of bonus. The distribution of the latter will be 10 per cent. on the present ordinary, the price of which now stands at 150. It may not be considered wholly uncharitable to infer that the recent material rise in the price of the ordinary stock was due to intelligent anticipation that some kind of bonus distribution might be made.

Ever-Ready shares recovered to 4¾, after being 4½, on the issue of a good report. Iron and steel descriptions hold their recent gains, and Armstrong debentures attract buyers. Advances of several points have occurred in the junior issues. The rubber market is a trifle better. Business in most industrial sections is tolerably active.

Share List of Electrical Companies.

	Nom.	Dividend. 1925.	Dividend. 1926.	Price May 9, 1927.	Rise or fall.	Yield. p.c.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	£1	14	14	37/-	—	4 18 8
Brompton Ordinary	1	10	8¾	25/6	—	5 11 6
Charing Cross Ordinary	1	15	8½	25/-	—	5 12 0
do. do. 4½ Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	12	8¾	25/-	—	5 12 0
City of London	1	15	10	13¾	—	5 1 10
do. do. 6% Pref.	1	6	6	23/6	—	5 6 8
Clyde Valley	1	8	8	31/-	—	5 3 3
County of London	1	15	7½	28/-	—	5 0 0
do. do. 6% Pref.	1	6	6	22/6	—	5 6 8
Edmundson's Ordinary	1	7	8	26/9	—	5 19 6
do. 7% Pref.	1	6	7	23/6	—	5 19 2
Elec. Supply Corporation	1	10	10	32/-	—	6 5 0
Kensington Ordinary	1	15	8	25/-	—	5 12 0
Lancs. Light and Power	1	7½	7½	27/-	—	5 11 1
London Electric	1	10	8½	24/-	—	5 16 8
do. do. 6% Pref.	5	6	6	5½	—	5 9 1
Metropolitan	1	11	8	28/6	—	4 18 3
do. 4½% Pref.	1	4½	4½	17/-	—	5 2 10
Midland Counties	1	5½	6	22/6	—	5 6 8
Newcastle-on-Tyne Ordinary	1	7	5	22/6	—	4 5 1
do. 5% Pref.	1	5	5	17/6		5 14 3
do. 7% Pref.	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	10	—	6 0 0
North Met. Elec. 6% Pref.	1	6	6	29/-	—	5 9 1
St. James' and Pall Mall	5	17½	8	25/6	—	5 9 10
South London	1	15	8½	25/-	—	5 12 0
South Metropolitan Pref.	1	7	7	1¼	—	6 3 0
Urban Ordinary	1	4	7	26/3	—9d.	5 6 5
do. 6% Pref.	1	6	6	1 2/6	—	5 13 0
Westminster Ordinary	1	15	8½	25/-	—	5 12 0
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	20/9	—	7 8 2
Yorkshire Elec.	1	8	8	29/6	—	5 8 4
HOME RAILS.						
Central London Ord. Assented	Stock	4	4	71	—	5 13 8
Metropolitan	„	5	3	64	—	4 13 9
do. District	„	3½	3½	53	—	5 11 0
Underground Electric	£1	Nil	1½	18/6	—	1 12 5
do. do. Income	Bonds	6	6	102	—	*5 17 8
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	101	—	5 19 0
do. Def.	„	1½	1½	24¼	—	6 3 9
Automatic Telephone	1	8	10	46/3	—	4 6 7
Chili Telephone	5	5	6	6⅞	--	4 13 2
Eastern Extension	10	10	10	17⅞	+⅛	*5 12 0
Eastern Tel. Ord.	Stock	10	10	180	+4½	*5 11 1
Globe Tel. and T. Ord.	10	10	10	18⅞	+⅛	*5 6 0
do. do. Pref.	10	6	6	11	+⅛	5 8 1
Great Northern Tel.	10	20	20	28½	+½	7 0 4
Indo-European	25	8½	10	47½	+1	*5 5 3
Marconi	1	Nil	Nil	17/6	—	... ...
Marconi-Marine	1	7½	8½	23/9	—	7 7 4
Oriental Telephone Ord.	1	12	12	52/6	—	*4 11 5
United R. Plate Tel.	5	8	8	9	+⅛	*4 9 0
Western Telegraph	10	10	10	17⅞	+⅛	*5 15 1
HOME AND FOREIGN TRAMS, &C.						
Anglo-Arg. Trams First Pref.	5	5½	5½	3½	+1/16	7 17 2
do. do. 2nd Pref.	5	6	6	3 1/16	—	8 2 8
do. do. 5% Deb.	Stock	5	5	71½	—	7 0 0
British Electric Traction Ord.	„	8	—	150	—1	5 6 8
do. do. 6% Pref.	„	6	8	120	+8	6 13 4
Brazil Traction	100	5	6	144	+1	4 3 4
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	89½	—	5 11 9
do. do. Preferred		6½	6½	118½	+1	5 5 6
do. do. Deferred	„	8	—	158	—	*5 1 3
do. do. Deb.	„	4½	4½	80½	—	5 5 7
London & Sub. Trac. 5% Pref.	1	Nil	Nil	7/9	—	Nil
London United Tram. Deb.	Stock	4	4	51	—	7 16 10
Mexico Trams, 5% Bonds	—	5	5	79½	+4½	6 5 9
Mexican Light Common	100	Nil	Nil	45		Nil
do. Pref.	100	Nil	Nil	115	+7	Nil
do. 1st Bonds	—	5	5	72½	+4	6 17 11
Yorkshire (West Riding)	1	5	—	8/9	—	... ...
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	13	13	55/-xd	—	4 14 6
British Aluminium Ord.	1	12½	10	43/9	—2d.	4 11 4
British Elec. Transformer Pref.	1	Nil	7	18/3	—	7 13 6
British Insulated Ord.	1	15	15	68/9	—1/3	4 7 3
Brush Ord.	1	10	—	28/3	—	7 1 7
Callenders	1	15	—	3½	—	4 5 9
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	10/-	—	... ...
Edison-Swan	£/-	10	10	10/	—	4 0 0
do. 5% Deb.	Stock	5	5	85	—	5 17 8
Electric Construction	1	10	10	28/9	— 1/3	6 19 2
Enfield Cable Pref.	1	7½	7½	1¼	—	6 6 4
English Electric	1	Nil	Nil	10/-	—	... ...
do. do. Pref.	1	3	—	12/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 9
do. Ord.	1	7½	—	30/6	—	4 18 4
Henley	1	20	—	90/-	—	4 8 11
do. 4½% Pref.	5	4½	4½	4¼	—	5 6 8
India-Rubber	1	5	5	1⅛	—	*4 9 0
Johnson & Phillips	1	17½	12½	2⅜	—	5 5 3
Met.-Vickers Ord.	1	8	8	27/6	—	5 11 4
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	7½	—	26/9	—	5 13 2
Telegraph Construction	12	10	10	28½	—	*4 4 2

* Dividends paid free of Income Tax.

The Electrical Imports of India.

Principal Sources of Supply.

FULL details of India's import trade in 1925-26 in electrical goods, showing the principal countries of supply, have recently been issued. From these the following particulars have been extracted. The corresponding figures for 1924-25 have been added for purposes of comparison and a note of increases or decreases given :—

	1924-25. Rs. (Thous.)	1925-26. Rs. (Thous.)	Inc. or dec. Rs. (Thous.)
Control and switchgear—			
Total	3,647	3,640	– 7
From United Kingdom	3,410	3,253	– 157
„ United States	94	139	+ 45
Generators, alternators and dynamos—			
Total	3,185	4,193	+1,008
From United Kingdom	2,948	3,684	+ 736
„ United States	87	196	+ 109
„ Switzerland	38	47	+ 9
„ Germany	69	175	+ 106
„ Italy	8	17	+ 9
Motors—			
Total	3,972	3,459	– 513
From United Kingdom ...	3,345	2,747	– 598
„ United States	343	330	– 13
„ Sweden	51	65	+ 14
„ Germany	127	166	+ 39
„ Switzerland	37	21	– 16
„ Italy	12	37	+ 25
Transformers—			
Total	1,322	1,849	+ 527
From United Kingdom ...	1,096	1,339	+ 243
„ United States	182	384	+ 202
„ Germany	11	101	+ 90
„ Italy	6	3	– 3
„ Holland	25	12	– 13
Turbo-generator sets—			
Total	407	2,760	+2,353
From United Kingdom ...	252	2,564	+2,312
„ Germany	—	119	+ 119
„ United States	139	52	– 87
Other electrical machinery—			
Total	7,693	6,333	–1,360
From United Kingdom ...	6,606	4,807	–1,799
„ United States	673	872	+ 199
„ Switzerland	3	6	+ 3
„ Germany	143	231	+ 88
„ France	21	4	– 17
„ Italy	28	28	—
„ Belgium	14	30	+ 16
„ Czecho-Slovakia	14	—	– 14
Electric fans and parts—			
Total	2,553	2,825	+ 272
From United Kingdom ...	1,315	1,617	+ 302
„ Italy	482	635	+ 153
„ United States	178	205	+ 27
„ Germany	558	350	– 208
Wires and cables, rubber insulated—			
Total	2,902	3,715	+ 813
From United Kingdom ...	2,681	3,379	+ 698
„ United States	33	24	– 9
„ Germany	139	202	+ 63
Ditto, other insulation—			
Total	1,966	2,286	+ 320
From United Kingdom ...	1,837	2,109	+ 272
„ United States	10	5	– 5
„ Germany	92	80	– 12
„ Holland	17	54	+ 37
„ Belgium	4	11	+ 7
Telegraph and telephone wires and cables—			
Total	212	163	– 49
From United Kingdom ...	180	162	– 18
„ Germany	18	—	– 18
„ Japan	12	—	– 12
Bare copper wire, electrolytic, other than telegraph and telephone wire—			
Total	1,584	1,538	– 46
From United Kingdom	1,430	1,158	– 272
„ Germany	25	193	+ 168
„ Holland	96	83	– 13
„ Japan	25	51	+ 26
Telegraph and telephone instruments and apparatus—			
Total	865	770	– 95
From United Kingdom	760	702	+ 58
„ United States	66	20	– 46
„ Sweden	7	27	+ 20
„ Germany	8	16	+ 8
Electric glow lamps—			
Total	1,232	2,001	+ 769
From United Kingdom	407	791	+ 384
„ Holland	531	565	+ 34
„ Germany	163	147	– 16
„ Austria	77	182	+ 105
„ United States	18	54	+ 36
Electric lamps, other sorts—			
Total	275	474	+ 199
From United Kingdom	47	46	– 1
„ Germany	46	52	+ 6
„ United States	152	349	+ 197
Batteries—			
Total	729	889	+ 160
From United Kingdom	371	430	+ 59
„ United States	203	216	+ 13
„ Germany	150	241	+ 91
Electric carbons—			
Total	89	63	– 26
From United Kingdom	75	41	– 34
Accumulators—			
Total	1,206	1,216	+ 10
From United Kingdom	987	902	– 85
„ United States	176	89	– 87
Electric condensers (nearly all from U.K.)—			
Total	29	26	– 3
Electric bell apparatus—			
Total	13	18	+ 5
From United Kingdom	2	7	+ 5
„ Germany	6	10	+ 4
„ United States	4	1	– 3
Lighting accessories and fittings, including switches—			
Total	1,392	1,613	+ 221
From United Kingdom	861	941	+ 80
„ Germany	157	197	+ 40
„ United States	332	428	+ 96
Meters—			
Total	645	630	– 15
From United Kingdom	437	462	+ 25
„ Germany	161	93	– 68
„ Switzerland	8	49	+ 41
„ United States	35	15	– 20
Electro-medical apparatus—			
Total	106	284	+ 278
From United Kingdom	46	112	+ 66
„ United States	27	117	+ 90
„ Denmark	15	—	– 15
„ Germany	8	14	+ 6
„ France	—	32	+ 32
Switchboards (other than telegraph and telephone)—			
Total	408	321	– 87
From United Kingdom	389	305	– 84
„ United States	10	4	– 6
„ Germany	5	8	+ 3
Electrical goods and apparatus, unenumerated—			
Total	3,219	2,966	– 253
From United Kingdom	2,154	1,810	– 344
„ Germany	599	489	– 110
„ United States	255	376	+ 91
„ Japan	101	163	+ 62

The Electrical Trade of Holland.

THE following statement, showing the imports and exports of electrical and similar goods into and from Holland during the year 1926 is compiled from the recently-issued statistics. The figures for 1925 are added for purposes of comparison and notes of any increases or decreases are given :—

Imports.

	1925. Florins. Thous.	1926. Florins. Thous.	Inc. or dec. Florins. Thous.
Electric generators, motors, transformers and rotary convertors—			
Total	5,739	7,763	+2,024
From Germany	3,701	4,488	+ 787
,, Great Britain ...	734	1,008	+ 274
,, Switzerland	436	1,016	+ 580
,, Belgium	239	393	+ 154
,, United States ...	156	175	+ 19
,, France	198	336	+ 143
Electric locomotives—			
Total	3	60	+ 57
Wireless apparatus—			
Total	2,472	3,434	+ 962
From Germany	811	1,234	+ 423
,, Great Britain ...	767	827	+ 60
,, France	347	600	+ 253
,, United States ...	305	444	+ 139
Telegraph and telephone apparatus—			
Total	3,689	4,263	+ 574
From Germany	2,218	2,682	+ 464
,, Belgium	184	536	+ 352
,, Sweden	622	411	− 211
,, Great Britain ...	426	274	− 152
Other electrical apparatus and instruments—			
Total	5,695	6,554	+ 859
From Germany	4,571	4,719	+ 148
,, Sweden	46	69	+ 23
,, Great Britain ...	396	578	+ 182
,, United States ...	163	171	+ 8
,, Switzerland	361	714	+ 353
Steam boilers—			
Total	4,782	5,754	+ 972
From Germany	1,943	2,219	+ 276
,, Great Britain	2,171	2,683	+ 512
,, Belgium	284	538	+ 254
,, France	226	225	− 1
Electric cable, insulated—			
Total	9,030	8,013	−1,017
From Germany	8,090	7,004	−1,086
,, Belgium	374	549	+ 175
,, Great Britain ...	263	158	− 105
Steam engines and turbines—			
Total	2,154	2,867	+ 713
From Germany	869	1,232	+ 363
,, Great Britain ...	610	776	+ 166
,, Belgium	136	175	+ 39
,, Sweden	121	72	− 49
,, Switzerland	249	369	+ 120

Exports.

	1925. Florins. Thous.	1926. Florins. Thous.	Inc. or dec. Florins. Thous.
Electric locomotives—			
Total	232	23	− 209
Wireless apparatus—			
Total	879	3,343	+2,464
To Germany	70	403	+ 333
,, Great Britain	537	747	+ 210
,, Dutch East Indies ...	139	285	+ 146
Electric generators, motors, transformers and rotary convertors—			
Total	2,856	2,682	− 174
To Germany	470	695	+ 225
,, Belgium	529	420	− 109
,, Dutch East Indies ...	398	489	− 99
,, Spain	204	148	− 56
,, South Africa	213	261	+ 48
,, Australia	154	83	− 71
Telegraph and telephone apparatus—			
Total	531	594	+ 63
To Great Britain	194	301	+ 107
,, Dutch East Indies ...	43	51	+ 8
,, Germany	78	109	+ 31
,, Italy	138	*	−
Other electrical apparatus and instruments—			
Total	1,597	1,526	− 71
Steam boilers—			
Total	2,214	2,313	+ 99
To Dutch East Indies ...	890	1,389	+ 499
,, Egypt	249	*	—
,, South Africa	387	186	− 201
,, Curaçao	135	302	+ 167
Insulated copper wire and cable—			
Total	3,276	3,277	+ 1
Metal filament lamps—			
Total	21,996	17,806	−4,190
To Belgium	1,767	1,299	− 468
,, Great Britain	1,632	1,112	− 520
,, France	3,507	2,092	−1,415
,, Italy	2,001	2,181	+ 180
,, Spain	813	880	+ 67
,, Argentina	968	1,217	+ 249
,, Brazil	802	373	− 429
,, Canada	472	*	—
,, Australia	1,456	1,567	+ 111
,, Dutch East Indies ...	716	572	− 144
,, Russia in Europe ...	891	*	—
Steam engines and turbines—			
Total	1,841	1,910	+ 69
To Germany	138	217	+ 79
,, Belgium	85	169	+ 84
,, Dutch East Indies ...	882	895	+ 13
,, Switzerland	96	*	—

(Florin or Guilder=about 1s. 8d.)

* Not separately distinguished.

British Goods in Argentina.

The subject of conditions in the Argentine market, particularly as they affect British goods, is again dealt with by the Buenos Aires correspondent of the *Chamber of Commerce Journal*. He says that certain recent events have created an atmosphere favourable to British goods and unfavourable to American wares. "Happily there appears to be a better realisation of market needs, as well as of the difficulties which those who sell goods here have to face. The agency question, in one or two cases which have come under the writer's knowledge, is being studied in a more liberal spirit, though it must be added that there is still a disposition to try and find men who are willing to work on what, for want of a better phrase, may be termed old-fashioned conditions. Contrasted with the American agency agreements, those of most English houses are illiberal and impractical in many clauses. American firms pay cables, costs on samples—which remain their property, and are re-shipped or sold when of no further utility, as they may direct—and all advertising outlay, the latter on a very liberal scale, while expenses of office and transport are matters of arrangement."

The Argentine trader's point of view is forcibly put in the March *Journal* of the British Chamber of Commerce in the Argentine Republic. In the course of a leading article the following appears :—"When we find London newspapers referring to the 'lack of energy and enterprise of British merchants' we are entitled to presume that the writer of the article is well primed with ideas as to how the British merchant in Argentina can redouble his energies and enliven his enterprise. But is he aware of the fact that this market is perhaps the most keenly competitive market in the world to-day, that the condition of the rural industries is so momentarily unsatisfactory that the price factor is even more impressive to the purchaser than it has ever been before, and that the agents and representatives of British firms are, in the majority of cases, working on a narrower margin of commission and with less support in respect of publicity expenses than competitors serving the interests of other nations. The fact that British trade in Argentina has not suffered even more severely than has been the case, really speaks volumes for the energy and enterprise of British merchants in this country, for . . . in addition to the difficulties created in the sphere of production by such factors as strikes and continuous unemployment, there are others of an equally harassing quality which manifest themselves at the merchandising end of the trade channel. However, a more earnest interest is being taken in the potentialities of this market, while the mere fact that the ordeal of direct comparisons with other countries have not been shirked, is a very good sign and should lead, eventually, to a reasonably accurate distribution of responsibilities for anything that may be lacking in the scheme of British trade reconstruction in Argentina."

New Electrical Devices, Fittings and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

A Weatherproof Bell.

A recent introduction of the MARCONIPHONE CO., LTD., 210-212, Tottenham Court Road, London, W.1, is a Sterling loud-ringing weatherproof bell of novel design for a.c. working, fig. 1. It is primarily a loud-ringing magneto extension bell and eliminates the use of relays and local bell circuits; it is claimed to be suitable for factory alarms. It is designed for continuous working at 220 V, but the pressure may be considerably increased for intermittent working. The operating movement, which has a resistance of 1,000 ohms for standard use, is of the polarised type with no contact breaker, and is thus suitable for use in gas-laden atmospheres. The signal is

Fig. 1.—Loud Magneto Bell.

said to be of a very distinctive character, capable of being easily heard above other signals and over a considerable area. The bell is enclosed in a robust cast-metal case finished with black enamel. The hammer protrudes through an aperture underneath, and is well protected by the gongs. Access to the terminals and working parts is easily obtained by removing the cover, which is held on with four screws and clamps down on to some packing in the base, making a watertight joint. A watertight cable gland fitted to the side takes the incoming cable, and a wrought-iron fixing strap is fitted to eliminate the risk of the casting breaking, due to strain when fixing. The gongs are mounted eccentrically to allow of ample adjustment. An earthing terminal is fitted near the cable gland.

A Kettle Protective Device.

A recent development of MESSRS. CREDENDA CONDUITS CO., LTD., Oldbury, Birmingham, is the "Creda" protector kettle, which is equipped with a cut-off device of very simple design. Figs. 2 and 3 depict the automatic arrangement. Excessive

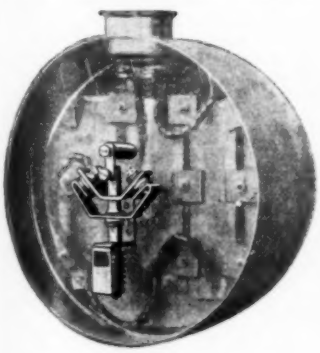


Fig. 2.—Automatic Device Closed.

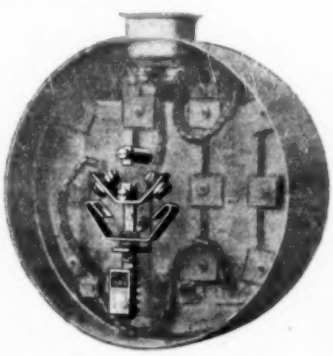


Fig. 3.—After Operation.

heat melts a tiny fuse, which releases the spring-controlled movable portion of a protective switch, throwing it into the "off" position. When the device has operated the words "Boiled Dry" appear in a small window in the base of the kettle. The kettle is made in six sizes with capacities ranging from 2 to 8 pints and loadings from 650 to 1,300 W respectively.

A Novel Cable Gland.

An interesting design of cable gland has recently been introduced by the WALSALL HARDWARE MANUFACTURING CO., LTD., Hatherton Works, Ablewell Street, Walsall. It consists essentially of four parts, and the arrangement is shown in figs. 4 and 5. A suitable screwed nipple is provided for the necessary connection to the box. A gland through which the lead-sheathed cable is passed serves for the bonding of the sheath, and is provided with a suitable collar by means of which a nut screws it right home to the nipple. Hinged to this nut is a clamp which, when in position and tightened up, clamps

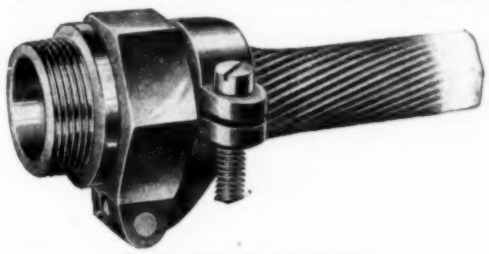


Fig. 4.—Cable Gland in Position.

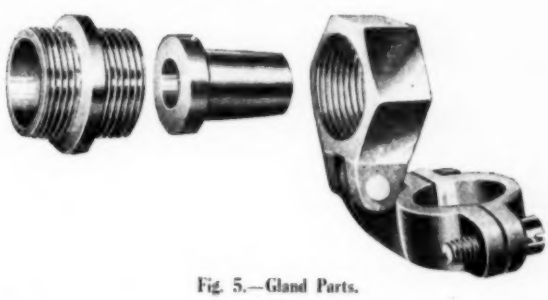


Fig. 5.—Gland Parts.

the armouring to the gland. It is claimed that the metallic connection between the box and the cable is watertight and that a perfect joint can be made in less than half the time required by the old method.

A New Change-over Switch.

We have received from the MIDLAND ELECTRIC MANFG. CO., LTD., Barford Street, Birmingham, some particulars of its most recent production, the "Memlock" change-over switch, fig. 6.

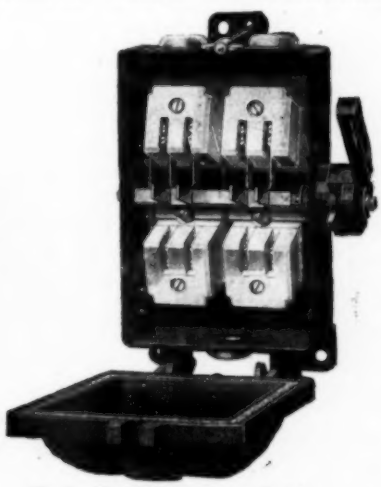


Fig. 6.—Ironclad Change-over Switch.

This is made in three sizes, 15-, 30-, and 60-A capacities, for both double- and triple-pole types, and is suitable for pressures up to 500 V. The smallest size is particularly suitable for shop-window lighting under special tariffs. The contacts are completely shrouded in porcelain and the positive quick-make-and-break action is independent of the springs. The apparatus is contained in a cast-iron case with a jet-black enamelled finish. The lead-in and-out holes are of standard clearance size for conduit, and bushes are also provided.

Selected Radio-Telephone Apparatus.

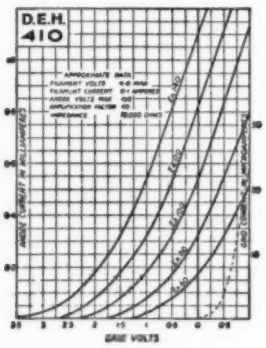
Recent Developments and Improvements.

New "Steep-Slope" Valves.

The interest created by the recent introduction of the 2-volt DEP.215 power valve has encouraged the MARCONIPHONE CO., LTD., and the GENERAL ELECTRIC CO., LTD., to add to the series. The three new patterns, of which we have had samples, are of the 4-volt filament type, each having a current consumption of only one-tenth of an ampere.

The DEH.410 is a valve specially designed to have a very high amplification factor, while at the same time to keep its internal impedance down to moderate limits. Thus when the now very popular method of resistance-capacity coupling is used, the magnification with one of these valves and suitable resistance should be equal to transformer coupling; in addition, when worked at a lower anode voltage the sharp bend of the characteristic curve permits this type to be employed as an "anode-bend" detector: its characteristics are:—Anode voltage, 140 V max.; amplification factor, 40; impedance, 70,000 ohms; normal slope, 0.57 mA per volt.

The DEL.410 valve may be used in almost any position, having features which conduce to marked economy in the running of the set, and is preferable to the "Osram" DE.3, which is designed primarily for operating off dry batteries; it being rated 3.8 to 4 volts, there is far less danger of over-running the new one, and no special filament resistance is



Figs. 1 and 2.—"Steep-Slope" Valve and its Characteristic Curves.

required. Its characteristics are:—Anode voltage, 120 V max.; amplification factor, 13; impedance, 14,000 ohms; normal slope, 0.93 mA per volt.

The DEP.410 power valve falls into line, as a factor in economy, with its companions, for by means of the new "electronised" filament an increased surface is available for electron emission, and, in conjunction with the disposition of the electrodes, gives the valve its distinguishing "steep-slope" characteristic. Moreover, by the adoption of separate filament resistances as a precaution against over-running, it is now possible to use a real power valve in conjunction with the DE.3 type—a power valve which will work off dry filament batteries, if desired. The characteristics of the DEP.410 are:—Anode voltage, 120 V max.; amplification factor, 6.25; impedance, 6,250 ohms; normal slope, 1.0 mA per volt.

New Marconiphone Products.

A decidedly useful and neat component has been added to the range of accessories marketed by the MARCONIPHONE CO., LTD., in the form of a novel switch for cutting out the last stage of a receiver; it breaks the filament circuit of the last valve and then connects its anode socket to the corresponding socket of the previous valve holder, it being, of course, essential that both valves should operate at the same anode voltage.

Another new product is a valve holder the shock-absorbing material in which is a selected grade of soft rubber, which supports the valve and also insulates it entirely from any vibration that may be imparted to the set, tending to damp any movement of the valve itself. Unlike metal springing systems, resilient rubber does not introduce a period of its own.

New Siemens Batteries.

With 50 years' experience of battery manufacture, Messrs. Siemens Brothers & Co., Ltd., recently placed on the market two new types of dry batteries which are intended to be employed for energising the anode circuit of broadcast receiving sets. Known as the "60"- and "100"-volt patterns, they have been specially priced in order to compete with the cheap imported article, and preference given to the British product will not be regretted. The new batteries are tapped at convenient stages, and appear to be of standard construction, though a bituminous compound is used for insulating purposes instead of the usual wax.

Resistance Amplification.

The distinctive feature of the new method of resistance amplification due to Von Ardenne and Heinert is the employment of anode resistance of much greater magnitude than hitherto considered suitable: instead of the customary value of from 50,000 to 100,000 ohms, the use of megohms is advocated. This is a drastic departure from current practice, for it is usually assumed, as is pointed out in *Experimental Wireless and the Wireless Engineer*, that the anode resistance should be such that the fall of potential therein will still leave sufficient voltage at the anode to ensure that the valve will operate in the straight-line region of its characteristic curve, even with a negative grid voltage. If from 1 to 3 megohms are used with anode-battery voltages of, say, 50-100 volts, as recommended, practically the whole voltage will be absorbed in the resistance, leaving only about 10 to 20 volts on the anode, and it might therefore be anticipated that the anode current-grid voltage characteristic with the resistance in circuit would show pronounced curvature, which would cause partial rectification and distortion. Actually, however, the working characteristics obtained under these conditions are remarkably straight over quite useful ranges of grid voltage. The method appears to have all the well-known advantages of resistance-capacity amplification combined with a higher degree of amplification per stage than has hitherto been conveniently obtainable, at the same time avoiding the necessity for high anode battery voltages, but the claims made originally and the estimate of the possibilities of further development are a little over-enthusiastic, says Mr. F. M. Colebrook, who carefully examined the subject in a recent issue of the above-mentioned journal. He reaches the conclusion that low-frequency amplification by the new method can be stated to have the following characteristics:—

1. Amplification per stage amounting to from 80 to 95 per cent. of the voltage factor of the valve used; in the case of small amplitudes (up to about one volt) amplification of at least twenty per stage can be obtained by means of high voltage factor triodes: these results can be obtained with anode battery voltages of, say, seventy to one hundred volts.

2. Valves used in this way require in most cases considerably less than normal filament current.

3. Low-frequency amplification by this method will be practically free from amplitude or frequency distortion, if the component magnitudes are suitably chosen: the following are suggested:—Anode resistances: 1 to 2 megohms, for normal h.f. valves; 2 to 3 megohms for high voltage factor valves. Grid-leaks: 3 to 5 megohms. Coupling condensers: 1,000 to 2,000$\mu\mu$F. The following precautions must be observed: sufficient negative grid bias must be applied to each valve following a resistance stage to ensure that the grid voltage does not at any time rise above about two volts negative. The insulation resistance of all components used must be as high as possible. The wiring and valve sockets must be such as to reduce to a minimum the stray capacities of the system. The resistances used must also have small self-capacity; ordinary grid leaks of standard make appear to be satisfactory.

New B.T.-H. Valves.

A series of 2-volt 0.1-amp. filament, 100-volt anode, valves is being produced by the BRITISH THOMSON-HOUSTON CO., LTD. The B.21 high-frequency and detector has an amplification factor of 16, an anode a.c. resistance of 32,000 ohms, and a mutual a.c. conductance of 0.5 mA per V. The B.22 general purpose type has an amplification factor of 7.5, an anode a.c. resistance of 14,000 ohms, and a mutual a.c. conductance of 0.53 mA per V. The B.23 power amplifier (the filament current of which is 0.2 A) has an amplification factor of 6, an anode a.c. resistance of 8,000 ohms, and a mutual conductance of 0.75 mA per V, being a last-stage companion to the B.8 valve and approaching the performance of the B.4 type.

The Institution of Electrical Engineers.

The Council's Annual Report and Accounts for 1926-27.

DR. W. H. ECCLES, F.R.S., president, occupied the chair at the annual general meeting on May 5th, and announced that the Council had made the following awards of premiums for papers during the 1926-27 session:—Institution premium to Messrs. J. R. Beard and T. G. N. Haldane. Ayrton premium to Lt.-Col. K. Edgcumbe and Mr. F. E. J. Ockenden. Fahie premium to Mr. G. F. O'dell. John Hopkinson premium to Mr. P. Dunsheath. Kelvin premium to Mr. J. W. T. Walsh. Paris premium to Mr. A. R. Cooper. Webber premium to Mr. W. McClelland. Extra premiums to Mr. A. H. M. Arnold; Mr. F. W. Carter; Mr. A. Rosen. Wireless premiums to Mr. T. L. Eckersley; Messrs. R. V. Hansford and H. Faulkner. The awards for papers read before Students' Sections will be announced later.

Dr. Eccles then moved the adoption of the Council's report, which is summarised below.

Annual Report.—(*Abstract.*)

The Institution has continued to progress and prosper; the net increase in membership is the satisfactory figure of 505, and it is a matter for congratulation that the 12,647 members include no less than 3,625 students, who will in time provide the largest recruiting ground for the class of corporate members. Senatore Guglielmo Marconi, G.C.V.O., LL.D., D.Sc., was elected an honorary member. The sixth award of the Faraday Medal was made to Elihu Thomson, D.Sc., honorary member. In April, 1924, the Société Française des Électriciens founded the Masscart Medal of Honour in memory of that eminent French scientist, to be awarded triennially to scientists or engineers distinguished for their work in pure and applied electricity, whatever their nationality. The first award of the medal was made in 1924 to Monsieur A. Blondel, Hon. M.I.E.E., and the second (1927) award has recently been made to Sir J. J. Thomson, O.M., M.A., F.R.S., Hon. M.I.E.E. Ten other honours and distinctions have been conferred on members. The Council records the death of 62 members during the year.

At the meeting on December 2nd, 1926, oil portraits of Faraday and Kelvin were formally installed in the lecture theatre, that of Faraday having been presented to the Institution by Mr. Sydney Evershed; the portraits are the work of Mr. George Harcourt, R.A. The Council has since accepted offers of portraits of Clerk Maxwell and of Wheatstone from Mr. Ll. B. Atkinson and Sir George Sutton, Bart., respectively, and also an offer by the Cable Makers' Association of a portrait in oils of Mr. Ll. B. Atkinson, which will be placed in the Council Chamber, where there are already oil paintings of former presidents.

During the past twelve months 358 meetings have been held in London and at the local Centres by the members, the Council, and the various committees. The attendances and proceedings at the meetings of the local Centres and Sub-Centres have well maintained the high standard of the past. Eight Wireless Section meetings have been held, at which six papers were read, and there were two informal discussions. A Local Wireless Section, of which three meetings have been held, has been formed at the South Midland Centre (Birmingham), and papers on wireless subjects have also been read and discussed at Manchester and Liverpool. Eleven informal meetings have been held during the session, the average attendance being 59, against 65 last year, and the eight Students' Sections carried out a very full programme of meetings, visits to works, and social functions, and a summer meeting was held in Belgium and Luxemburg.

The Faraday lecture, by Prof. W. M. Thornton, O.B.E., D.Sc., who took for his subject "What is Electricity?," was delivered at London, Birmingham, Bristol, Dublin, Glasgow, Leeds, Liverpool, Manchester, and twice at Newcastle-on-Tyne. The total attendance was approximately 6,000, and the presence of over 4,000 non-members indicates that the lecture achieved the object in view, *viz.*, the bringing of electricity to the attention of the public.

Under the scheme approved by the Council in 1925 for the publication in the *Journal* of periodical reviews of progress in electrical engineering, four reviews were published during 1926 and seven in 1927, and arrangements are being made for reviews of the three remaining sections to be published in 1928, together with further reviews of research and electrical standardisation. The Council will be glad if members will forward to the secretary of the Institution criticisms of the present reviews, and also suggestions as to the ground to be covered by those to be published in the future.

Two David Hughes scholarships and two Salomons scholarships (value £50 each, tenable for one year) were awarded. That part of the trust deed of the War Thanksgiving Education and Research Fund which provided for the education and technical training of men who served overseas in H.M. Forces during the great war has come to an end, as there are no longer any students at educational establishments who fulfil the condition of war service. A scheme has therefore been prepared which will permit of grants being made each year to one or more post-graduate research students, to assist them in carrying out approved researches of an electrical nature; the first of such grants will be made this year.

The Council appointed Mr. C. P. Sparks, C.B.E., Lieut.-Col. K. Edgcumbe, R.E. (T.A.), Mr. S. W. Melsom, and the secretary delegates of the Institution to attend the meeting of the International Electrotechnical Commission in New York from April 13th to 22nd, 1926; the meeting was attended by 116 delegates, representing 17 countries. At the annual conversazione in 1926 there was a record attendance of over 1,800 members and guests. At the annual dinner in 1927 the Prince of Wales was principal guest; there were present 618 members and guests, and the function was the largest of the kind held by the Institution.

The two sets of Conditions for Export Contracts B1 (delivery f.o.b.) and B2 (including complete erection or supervision of erection) are under revision.

During the year 128 books and pamphlets were presented to the reference library, and 58 volumes have been purchased. The total number of readers for the year was 4,666, of whom 139 were non-members, against 3,537 and 114 respectively in 1924-25. The circulation of books from the lending library has been well maintained; 71 new volumes were added, and 2,401 books were issued to 963 borrowers, the corresponding numbers for the previous year being 1,938 and 857 respectively. A new edition of the lending library catalogue, with a subject index, is available.

The net cost of printing and posting the *Journal* in 1926 was £4,447, compared with £4,166 in 1925. The increase was due partly to the greater size of the volume (1,230 pages, compared with 1,180 in the previous volume), and partly to the larger number of copies printed (12,800, against 12,500).

The Physics volume of *Science Abstracts* for 1926 contained 896 pages of abstracts, compared with 904 pages in 1925. The Electrical Engineering volume contained 584 pages of abstracts, compared with 616 pages in the previous year. Mr. H. G. Solomon has been appointed to the Institution staff and is charged with the editorial duties.

The Joint Committee set up by the Council of the Institution and the National Gas Council, "to consider whether in the national interest an inquiry might advantageously be held into the possibility of closer co-operation between gas and electricity undertakings in promoting capital and fuel economy in the supply to the public of energy derived from coal," held six meetings, and two sub-committees have been set up by it. Among the first matters which have engaged its attention are the utilisation of waste heat in gasworks and the consequent release of solid fuel for other uses, and also the utilisation of surplus coke or coke breeze from gasworks as fuel for steam-raising at electric power stations.

For the final examinations of 1926 the Joint Standing Committee representing the Board of Education and the Institution examined at various schools and colleges students from 58 approved courses for the award of ordinary certificates in electrical engineering, 23 courses for higher certificates (including 1 post higher certificate course), 4 courses for ordinary diplomas, and 1 course for higher diplomas; the number awarded was as follows:—245 ordinary certificates; 116 higher certificates (including 4 post-higher certificates); 8 ordinary diplomas; and 6 higher diplomas.

A further list of urgent amendments to the eighth edition of the Regulations for the Electrical Equipment of Buildings was approved by the Council last September for publication in the form of an alterations leaflet; in addition, alterations have been agreed upon as a result of suggestions received since the eighth edition was published, and it has therefore been considered advisable to issue immediately a revised edition (ninth) containing all the alterations referred to above. The Committee proposes, however, to proceed at once with a more comprehensive revision.

The Council has set up a Committee of representatives of the Institution and of bodies closely associated with electricity supply to consider and report on (*a*) the practicability and cost of raising or lowering to 230 the declared lighting

voltage of the general supply networks of all systems in Great Britain; (b) the ways in which the Electricity Commissioners may be able to assist voltage standardisation; (c) any other matters affecting the standardisation of low-voltage distribution systems.

The Council has adopted the following rule: "Any corporate member who has reached the age of 65 and has retired from the practice of his profession or business, may apply to the Council to remit or reduce his future annual subscriptions, provided that his membership of the Institution has been continuous for at least 25 years. If his request be granted, he may, nevertheless, be required to pay, at a rate to be determined by the Council from time to time, for such publications of the Institution as he may wish to receive."

On December 31st, 1926, the capital account of the I.E.E. Benevolent Fund stood at £12,003, and the accumulated income at £882. The donations and subscriptions to the fund in 1926 amounted to £1,484. In 1926, 87 grants were made to 32 persons, amounting to a total of £1,497. The accounts of the I.E.E. show a balance to the good on the revenue account for 1926 of £3,882, which compares with £1,196 in 1926. The income amounted to £38,179, compared with £35,620 in 1925. The assets amount to £152,906, an improvement of £8,279 on the 1925 figure.

Annual Meeting.

Mr. F. GILL seconded the motion to adopt the report.

Mr. D. G. HURLBATT suggested that the I.E.E. Electrical Appointments Board should be made better known, so that employers who found it necessary to increase their staffs could make use of the facilities offered.

Mr. F. W. PURSE expressed full satisfaction at the work done during the year. He compared the rate of increase of corporate and student membership, and counselled the encouragement of Students to "follow on" into higher grades so as to give the Institution the benefit of higher subscriptions as some compensation for the money it spent for their benefit in the earlier stages.

Mr. F. W. PHILLIPS again advocated the re-admission of late "enemy" members. The president explained that the Council had already approved of the change being made and in due course a meeting would be called to alter the by-laws accordingly.

The report was adopted.

The hon. treasurer, Lieut.-Col. F. A. CORTEZ LEIGH, moved the adoption of the accounts and balance sheet. Mr. ROGER T. SMITH seconded, and Mr. W. RAWLINGS offered congratulations on the extraordinary results of the year. The anticipated further increase in the assets next year, he said, showed that there was money to spend, and he accordingly advised that the I.E.E. grant of £500 to the British Engineering Standards Association should be increased to £1,000, which suggestion was supported by Mr. LL. B. ATKINSON.

The accounts having been adopted, a vote of thanks to the officers of the Institution was carried, and Messrs. Allen, Attfield & Co. were re-elected auditors.

Mr. D. J. BOLTON proposed a resolution to the effect that no paper should be rejected without some reason being given to the author. The motion was seconded, but it was opposed by several members for diverse reasons and the president suggested that it be withdrawn on his promise to bring the matter before the Council.

The withdrawal of the resolution terminated the meeting.

H.P. Transmission.

The Design of Towers for Overhead Lines, with Particular Reference to American Practice.

IN a paper read recently before the Institution of Structural Engineers, the author, Mr. H. R. White, outlined the general considerations necessary for designing overhead electrical transmission lines, and reviewed what has been done up to the present time, particularly in the United States and Canada.

Wooden and tubular poles and structural masts with wire guys were objectionable, he said, both electrically and as regarded the cost of maintenance. The tendency in America and Canada was to use structural steel towers, square in plan, of the self-supporting type, or, for very light or auxiliary lines, structural steel lattice poles of the self-supporting type. The mileage of transmission lines on the North American Continent and the consequent demand for these steel towers was such that leading makers formed entirely separate engineering departments and laid out independent shops to deal with this work.

The two most usual sets of loading in use in the United States were class A, 15 lb. per sq. ft. on the bare wire and 25 lb. on the structures, for districts where the temperature did not fall below freezing point, where it was found that in these districts a somewhat higher range of wind pressures was encountered than in winter time in the cold districts; class B, 8 lb. per sq. ft. on the cable covered with ice ½ in. radial thickness, and 13 lb. on the structures, for districts which were subject to low temperatures in winter. Where winter conditions were very severe a third loading, C, was used, in which case 11 lb. per sq. ft. was allowed on cables covered with ¾ in. thickness of ice. The wind load on the structure was taken on one and a-half times the exposed area of one side. It was customary to calculate the wind on the ice-covered wire at zero F.

The weight of the tower was a question of either experience or trial. Considerable experience was necessary to forecast weights accurately, it having been found absolutely impossible to standardise towers, no two lines being exactly alike.

The load due to the breaking of wires was usually taken at or near the elastic limit. It was the item of loading that chiefly accounted for the difference in design between various types of towers in a line.

The clearance between conductors and the nearest tower member for pin-type insulators was 12 in. for 22,000 V or less, and up to 19 in. for 44,000 V. In the case of suspension insulators swung 45 deg. from the vertical, the figures were the same, and ranged up to 61 in. for 165,000 V. In the case of suspension insulators swung 60 deg., due to an angle in the line, the figures were the same, but if due to wind load the clearances might be about 10 per cent. less due to the fact that the angle of 60 deg. was less likely to be maintained.

The clearance between one conductor and another for pin-type insulators was given for 44,000 V as 49 in. for 200-ft. spans, ranging to 82 in. for 800 ft. For suspension insulators at this voltage the clearances would be 56 in. and 100 in. respectively, while for 144,000 V the figures were 110 in. and 144 in. In the case of conductors swung 60 deg. it was necessary to use either a specially long insulator or to drop the point of suspension below the cross arm by means of a bracket in order to provide the necessary clearance between the wire when swung and the cross arm above it. The determination of the general outline would be based on the above figures, and it was here that the experience of a designer might effect considerable economy.

Open-hearth steel was used in the manufacture of these towers; the dead load was not a serious factor, and in a number of members the slenderness ratio governed. The loads and stresses were small by comparison with those in bridge and building work, and it was, therefore, necessary to use small sections. In some towers the legs were as small as 3½ in. by 3½ in. by ¼ in., and this was about as small as could be used consistent with economic detailing. Many towers contained web members 1½ in. by 1½ in. by ¼ in. Makers' specifications recommended a minimum thickness of 3/16 in. in an endeavour to advocate the use of more substantial towers, and due to the fact that some structures built in the early days were lighter than they should have been.

The American Bridge Co. and the United States Steel Products Co.'s tower shops were quite apart with separate organisation. All the work was punched, but the machines were designed and arranged to ensure exact duplication. Protection by galvanising was coming to be more and more generally used. It cost more than painting in the first place, but in the extra thickness of the members required for painting, and the cost of subsequent painting, the extra cost of galvanising disappeared. Galvanised structures should have a much heavier coating than was applied to ordinary materials.

Discussion.

Prof. J. HUSBAND pointed out that the towers used in France had a smaller base than similar towers in the United States because most of the lines in France ran over cultivated country and it was desired to create as little inconvenience as possible to the farmers.

Mr. J. C. TELFORD regarded the French method of casing the base of the column in concrete as better than putting it into bare earth. A feature of tower failures in America was that they were given prominence so that other people might learn from them. He asked if any experiments had been conducted on sherardising the whole of a tower.

Mr. S. BYLANDER said that for the railway electrification scheme from Gothenburg to Stockholm, in Sweden, the posts were made of two-channel lattice. The foundations for the towers were concrete, and one type of tower used near Stockholm had three legs and not four. This was the most modern and clever design he had seen, and made the tower cheaper. For towers not of too great a height it was the best type.

Prof. HUSBAND said the usual practice in France was to galvanise the upper parts of the towers which were near the live wires. The lower portions could be painted with safety whilst the current was on.

The author, replying to the discussion, said that the cost of timber varied very much in different parts of the world. In England it was very much more expensive than in America. It might be possible to get a lattice pole which cost double as much as a timber pole, but it would be of very much greater strength, not only as a pole, but in its ability to take up torsional stresses. The stresses recommended by the various manufacturing companies were such that, under test, members with punched holes and bolted connections gave 10 per cent. increase in strength at the joints, compared with what they gave in the member. Towers built in this way which had been tested to destruction did not fail at the joints but through buckling of the struts. He did not know what was the objection to sherardising, but people in America who had had sherardised poles would not have them any more. Triangular towers had not been found cheaper when tried for high radio towers. No allowance was made for rust when the towers were galvanised, and galvanising, if properly done, would last as long as 20 years.

The Trade Disputes Bill.

Debate on the Second Reading.

ON May 2nd the Government's Trade Disputes and Trade Unions Bill, which was dealt with in our issue of April 22nd, p. 633, came before the House of Commons, and four days were allotted for the debate.

In moving the second reading, the ATTORNEY-GENERAL (Sir Douglas Hogg) said that the Government believed that the Bill was well drafted, and, while it would be glad to accept amendments to remove any ambiguities, it would resist to the utmost any amendments designed to defeat the objects of the measure. The first five clauses, which were, perhaps, of the most general importance, could be stated in the form of four propositions:—(1) That a general strike was illegal, and no man could be penalised for not taking part in it; (2) That intimidation was illegal; (3) That no man should be compelled to subscribe to the funds of any political party; and (4) That Civil Servants must give their undivided allegiance to the State. The right of workmen to strike was preserved, although many legitimate industrial strikes affected large bodies of the community. To be illegal a strike had to be one which was not purely industrial, and was intended to coerce the Government or intimidate the community, or a substantial part thereof. The Government did not think that the inclusion of lock-outs in the Bill was possible. A general lock-out directed against the Government had never been suggested; any attempt would be met by the Government stepping in and running the undertakings, as it already had power to do. If, however, a case could be made out for the inclusion of lock-outs, the Government had no objection to including them. Employers, equally with workmen, were included in Clause 3, dealing with intimidation, and Clause 4, dealing with the political levy. Clause 2, which provided that no one should be penalised for refusing to take part in an illegal strike, definitely applied only to strikes declared by the Bill to be illegal; Sub-Section 3 of the clause made it retrospective to cover the general strike of last year. Clause 3 dealt with intimidation; peaceful picketing was not prohibited. Clause 4 altered the status of the political levy. The change from contracting-out to contracting-in should not injure those unions which had been loyal to the Act of 1913. Clause 5 dealt with the position of Civil Servants; Clause 6 prohibited public authorities from making trade union membership a condition of employment; and Clause 7 empowered the Attorney-General to apply for an injunction restraining a union from using its funds in contravention of the Bill. He asked the moderate Labour men to co-operate with the Government in improving the measure and making it workable.

Mr. CLYNES (Labour) moved the rejection of the Bill, saying that the fight against it would not end when it was on the Statute Book. The Bill would make it almost impossible for trade unions to enter into effective contracts with the Government or employers of labour. It would be the duty of his party to repeal the measure when it came into office. The Bill did not debar a group of men from striking, but it prevented their strike from being successful. As regarded intimidation, there had been a great deal of exaggeration. There was more on the other side: no weapon was so potent as the power of dismissal. The Civil Servants had taken no part in the general strike and, in addition to their obligations as Civil Servants, were entitled to the privileges of wage-earners. The political levy clause brushed aside an agreement come to between all parties in 1913, and it was an attempt to deprive the working classes of representation. Mr. HARNEY (Liberal) considered that the Bill was directed against all strikes by means of its "intimidation" clause, but Sir W. GREAVES LORD (Conservative) said that the clause was rendered necessary by the events of last year. Sir H. SLESSER (Labour) said that in the case of a strike being declared illegal it would be criminal for men to leave their employment even after giving notice; the Government was thus reducing workmen to a state of servitude. The Bill went far beyond a general strike; any strike which "intimidated the community" was illegal, and the word "intimidate" was not defined. The matter was purposely left vague for any interpretation to be put upon it and thus make any strike illegal.

Mr. HURST (Conservative) spoke in favour of the Bill, and Capt. MACMILLAN (Conservative) said that if the Government had not proceeded with the Bill it would have been interpreted as a sign of weakness. He and other Unionists would support the Government, hoping, however, that it was not the beginning of a reactionary policy. Mr. G. SPENCER (Labour) said that unless something upon the lines of the Bill were done, the unions would be captured by the revolutionary element. The Bill would do more good to the Labour Party than to any other. The movement against the Bill had not sprung spontaneously from the working man. Mr. Spencer continued his speech on May 3rd, and related his experiences during the coal dispute. He concluded by saying that the unions devoted more time to political than to trade union matters. Mr. A. HENDERSON (Labour) described the Bill as an invasion of the established rights and legal powers of the trade unions. It prevented combinations of workers, while capital was allowed to enter into any combination thought desirable. What was the position of such a body as the Transport and General Workers' Union which embraced men in a number of industries?

Sir L. WORTHINGTON EVANS (Secretary for War) said that Mr. Justice Astbury had decided that the general strike was illegal, and the Bill made the matter definite. Labour leaders had condemned the strike, but that did not preclude the possibility of another. Contrary to Opposition opinions, the Bill was designed to protect the working class, which was the greatest sufferer in a general strike. Sir R. HORNE (Conservative) considered that the Bill should include lock-outs, and said that that was the opinion of the bulk of the Conservative Party. If the political levy was really voluntary, the unions should not be injured in any way. The great mass of trade unionists would be grateful for the Bill. Mr. WALSH (Labour) said that under the Bill any strike could be made illegal, and the trade union movement would be rendered impotent.

On May 4th, Sir JOHN SIMON made a long speech, in the course of which he said that the objects of the Bill as expressed by the Attorney-General were unexceptionable. The real objection to the Bill was the method in which it was drawn up. He expressed doubt regarding the wisdom and necessity of the political levy clause, but agreed that if it was necessary no harm should be done. Clause 1 might lead to complications, and lock-outs should certainly have been included. He considered that a general strike was already illegal, and a simple declaration to that effect would have been sufficient, and he concluded by saying that all members should endeavour to make the Bill fulfil the declarations of the Attorney-General—neither more nor less. The PRIME MINISTER said that the Trade Disputes Act, 1906, took a far more extreme form than was originally intended, and the ground covered by trade unions had since then moved from industrial to political action, and in some unions the power was getting into the hands of the "minority movement," such as in the Miners' Federation. The Government had refrained from introducing legislation, and had decided not to proceed with Mr. Macquisten's Bill to deal with the political levy in 1925, but its hands were forced by the general strike; that was the Government's mandate for the Bill. He concluded by inviting the co-operation of the House in giving effect to the propositions enunciated by the Attorney-General. Mr. T. SHAW (Labour) said that the Bill aimed at the destruction of the Government's political opponents, and was so drafted as to provide endless work for the lawyers. It did not touch the employers, who were left to do as they pleased. Capt. O'CONNOR (Conservative) said that although it was incorrect to describe the Bill as "industrial conscription," it went a long way in that direction. It should be the aim in committee to prune the Bill and remove the ambiguities. Mr. DIXEY (Conservative) said that the measure should have been introduced two years ago. He also urged the Government to include lock-outs in it.

On May 5th, Mr. TOWNEND (Labour) said that no attempt had been made in the Bill in dealing with sympathetic strikes to define a line of demarcation between trades. Mr. SNOWDEN (Labour) said that if general strikes and intimidation were already illegal, the repealing of the Act by a Labour Government would leave things exactly as they were. Under modern conditions it was impossible to confine all disputes to the industries in which they arose, and the banning of sympathetic strikes rendered all strikes useless. The Government was constantly being coerced by all parties, including its own, and to merely refuse to work was a very peaceful form of coercion. No amount of legislation would stop a general strike if the workers intended to have one. The Bill said nothing about taking the leaders first; could they put 5,000,000 men in prison? He agreed that the inclusion of the employers would be useless for they had a thousand means of coercion at their disposal of which no legislation could deprive them. He ridiculed the attempt to expand the meaning of "intimidation," and with regard to the political levy said that improvements in conditions were mainly brought about by political means, and trade union members should be prepared to pay for them. He wished that the Government had devoted itself to the setting up of machinery to settle industrial disputes by reason and not force. Sir R. SANDERS (Conservative) claimed that the demand for the Bill had come from the working classes, not the employers.

Mr. LLOYD GEORGE (Lib.) challenged the wisdom of introducing the Bill at such a time. The Bill, instead of clarifying trade union law, created new obscurities. It was dangerous to leave the interpretation of its terms to magistrates who might unconsciously be prejudiced in favour of the employing class. The first clause rendered sympathetic strikes and all strikes in vital industries possible. With regard to Clause 4, the Mineowners' Association had used its funds freely for political purposes—would that be impossible in future unless a special fund were set up to which individuals would have to agree to subscribe? He did not believe that the general strike could be repeated, but how would the Bill stop one? No important industrial group of any kind wanted the Bill; it was dictated entirely by political expediency. Conditions were improving, and the Bill would set them back. Mr. JEPHCOTT (Conservative), speaking as a former trade unionist, said that a large number of unionists would be grateful for the measure if it separated industrial from political matters. Mr. WHEATLEY (Labour) claimed that whether a sympathetic strike was right was a question to be decided by the men concerned. The workers would find means of evading the Bill if it became law. Mr. HILTON YOUNG (Conservative) said that any attempt to substitute the rule of the Trade Union Congress for that of Parliament must be made impossible. Mr. J. H. THOMAS said that in his union 55,000 members were exempt from the political levy; among the shipwrights in Sunderland there were more exempted members than members paying the levy, and that also applied to the boilermakers. After preaching industrial peace, Mr. Baldwin had given his support to an attack upon the trade unions and his political opponents. After quoting examples of what he described as intimidation by employers, Mr. Thomas said that the unions were being deprived of the only weapon that they possessed. The bulk of the magistracy was of the employing class, and he had no doubt as to what their opinions of the legality of a strike would be. The Government had struck a serious blow at those who were desirous of peace in industry. The Solicitor-General (Sir T. INSKIP) said that Clause 1 did not prohibit a strike for the improvement of conditions in an industry even if it was a national one and might possibly bring pressure to bear on the Government and compel the community to submit. The word "sympathetic" was one of no very exact meaning, but the word "intimidate" was perfectly plain. Regarding Mr. SNOWDEN's suggestion that the Government might have to imprison five million workers, the speaker said that Acts of Parliament were not administered by the police, but by the law-abiding character of the English race. The employer was prevented from intimidating his men by Clause 3, just as much as the worker was prevented from the use of intimidation. If a man was compelled to join a union, he should be protected from compulsory contribution to a political fund. The Bill was wanted by the community which had suffered from the general strike. The closure was then moved and carried, and on a division the Bill was read a second time, the Government majority being 220. It was then decided to commit the Bill to a committee of the whole House.

Powdered Lignite in America.

Some notes on an electricity works in the United States which is said to be the largest user of powdered lignite for steam-raising purposes.

THE largest steam turbo-generator between the Mississippi River and the Pacific Coast of America has been installed in a Rocky Mountains generating station which at present claims to be the largest single consumer of powdered lignite fuel in the world. The turbine, a 25,000-kW set, being added to the Public Service Company's Valmont station wherein a 20,000-kW set is already in operation, was built by the General Electric Company of America. While the Valmont plant is at present said to be the largest consumer of lignite fuel, a larger plant is being installed in Texas to utilise lignite from that State: 80 per cent. of the powdered lignite tonnage is converted into utilised heat, the balance including 5 per cent. ash and 15 per cent. radiation and chimney gases.

Electricity is generated at 13,000 volts, stepped up to 100,000 volts, for transmission to Denver, and to 44,000 volts for the transmission system distributing throughout Northern Colorado. Lake Valmont, upon whose shore the plant is located, and which furnishes the condensing water for the steam turbines, has an area of 127 acres, or enough to care for four sets similar to the present ones. Land is owned and a dam site has been laid out to increase this area to 600 acres, which will care for the ten sets that are contemplated in the ultimate scheme.

The first step of economy in the use of powdered lignite, according to the practice at the Valmont plant, is the utilisation of a grade of fuel heretofore largely waste, consisting of the dust and slack from the mines. Before the fuel is powdered, the discharged hot fumes from the boilers are passed through it to extract the moisture; it is then ground in centrifugal mills of the Chilean type and lifted by air pressure created by fans to the distributing storage bins above the boilers. Its distribution to the combustion chambers of the boilers is by screw conveyor and air pressure, the air furnishing the necessary oxygen. A stream of powdered lignite one foot in diameter is fed into the boilers at the rate of eight feet per second. Within three feet after entering the combustion chamber the powdered fuel becomes entirely incandescent and burns like a gas, at a temperature of from 2,500 to 2,800 deg.

The ash falls in the form of a fine dust through the grates, which are internally water-cooled to prevent the ash from vitrifying. As this incombustible waste represents only 5 per cent. of the original volume of coal, its disposal is negligible. The lignite used is obtained from mines only a short distance away, and the present consumption is 1¼ lb. per horse-power-hour, representing from 400 to 500 tons daily.

Steam enters the turbines at a pressure of 375 lb. per sq. in. and a temperature of 680 deg. F., being exhausted into a 24-in. vacuum. The feed water to the boilers is preheated to 260 deg. under pressure, and all free oxygen is removed from the water to prevent corrosion in the boilers. The condenser cooling water enters at a temperature of 70 deg. during the summer and discharges at from 78 to 80 deg. Each unit uses 40,000 gallons per minute, supplied by two 20,000-gallon pumps.

Two independent transmission lines furnish outlets from the Valmont plant to Denver, Boulder, Fort Collins, and Greeley, which arrangement ensures against interruption of service.

Parliamentary News.

(By Our Special Parliamentary Reporter.)

The Trade Disputes Bill.

After a four-days' debate, the House of Commons, on May 5th, carried the second reading of the Trade Disputes and Trade Unions Bill by 386 votes to 171. A report of the debate appears on p. 779.

Wednesday and Thursday of this week were to be devoted to the Committee stage, and the Government had prepared amendments providing for the inclusion of lock-outs in the Bill and substituting the words "inflicting hardship upon the community" for "intimidating the community or any substantial portion of the community" in the definition of an illegal strike.

The Southern Railway Contract.

On May 4th Mr. DENNISON asked the Minister of Labour whether the recent contract given by the Southern Railway Company to a Swedish electrical company would involve the introduction into this country of Swedish artisans; and if he was prepared to give permits to such foreign workpeople to take part in the erection of plant and machinery manufactured abroad while large numbers of British skilled engineers were still unemployed.

Sir A. STEEL-MAITLAND said that no application for permits in that connection had so far been received. He could not say what decision he should come to unless and until such an application was made.

Mr. HANNON asked the Financial Secretary to the Treasury if, having in view the guarantees given by the Trade Facilities Committee for the electrification of the Southern Railway, any condition was imposed on the railway company that, as far as possible, contracts should be placed in this country.

Mr. MCNEILL said that the South-Eastern and Chatham Construction and Equipment Co. did not avail itself of the guarantee, which was subsequently withdrawn.

Railway Electrification.

On May 3rd Mr. HANNON asked the Minister of Transport whether the Electricity Commissioners had been consulted on the extension of the electrification schemes of the Southern Railway Company; and if such extension schemes had had their approval.

Colonel ASHLEY said that the approval of schemes for extensions of railway electrification was not a matter in which the Electricity Commissioners were directly concerned.

On May 5th Lt.-Commander KENWORTHY asked the Minister of Transport how many miles of main railway line had been electrified in Great Britain, and whether plans had been prepared for the electrification of other portions of the main line railway system.

Colonel ASHLEY said that at December 31st, 1926, 946 track miles of the railway lines of the four amalgamated companies were worked either wholly or partly by electric traction. In addition, 295 track miles of railways belonging to other companies, mainly operating in London, were worked by electric traction on that date. He understood that the principal railway companies had the question of railway electrification constantly before them.

Oil from Coal.

On May 5th, in reply to Mr. Thurtle, who asked for information as to whether the process of extracting oil from coal was now being carried out on a commercial basis in Germany, the Duchess of ATHOLL said that low-temperature carbonisation processes had long been employed for the extraction of oil from brown coals in Germany. It was understood that oil was now also being produced on a commercial scale in Germany by the hydrogenation of brown coal.

Private Bills.

The London and Home Counties Joint Electricity Authority (No. 2) Bill has been read a second time in the House of Commons. The Yorkshire Electric Power Bill and the Farnham Gas and Electricity Bill have been read a third time and passed in the Lords.

A Select Committee of the House of Commons this week commenced the consideration of the County of London Electric Supply Co. Bill, the principal object of which is the extension of the company's powers in relation to the supply of electricity in Essex.

Correspondence.

Correspondents should forward their communications as early as possible. ***No letter can be published unless we have the writer's name and address in our possession.***

Electroculture.

I note in your issue of April 29th that your Paisley correspondent would like to have particulars of experiments in the culture of tomatoes by means of electricity.

This is a method of treatment which has been tried in several forms by a number of people from time to time. In tomato growing, electricity can be used in the following five ways:—

(1) *Seed treatment.* Mr. A. Carr Bennett, of Fairfield, New South Wales, has reduced the electric treatment of seeds to a commercial proposition, and particulars of his results are contained in a book published by Messrs. Angus & Robertson, Ltd., 89, Castlereagh Street, Sydney, entitled "Electro-Culture, the Application of Electricity to Seeds in Vegetable Growing." Mr. Carr Bennett reports phenomenal yields from crops of treated seeds and considers that such treatment so strengthens the seed, that weeds have little chance of making way in their neighbourhood. Not only is the yield increased, but the quality of the tomatoes is enhanced.

The Wolfryn process of seed treatment, which has been developed in England, does not seem to have been tried on the tomato seed, but there is no reason why it should not be as successful as with other seeds.

(2) *High-tension treatment* by means of positively charged wires placed close above the plants (about 1,000 volts).

(3) *Local electric heating.* By placing a heating cable in the soil, under the roots of the plants.

(4) *Intensive illumination.* Intensive electric light can be applied (*a*) to seedlings immediately after transplanting in order to prevent wilting, and (*b*) to plants, in order to speed up the flowering. The time of maturity can to a certain extent be regulated, *i.e.*, the grower could be sure of having fruit available in time for the best markets.

(5) *Sterilisation of soil,* by means of a portable electric steam boiler.

As far as the bibliography of this subject is concerned, little has been written dealing with the electrical side, but I suggest that your correspondent in addition to the above booklet should refer to "The A.B.C. of Tomato Growing," by W. Dyke (The Lockwood Press), post free 3s. 9d. Two books on the general subject which might also interest him are "Growing Crops and Plants by Electricity," by E. C. Dudgeon (Rentell), and "Electricity in Agriculture and Horticulture," by K. S. Lemström (Benn Bros.), although neither of these deals specifically with tomatoes.

By the way, in an article that you asked me to write for your Jubilee issue on the future of electro-farming, I suggested that probably concrete beds would be employed in which to grow crops. It is of interest to note that to-day this is an accomplished fact for tomato and water-cress growing.

R. Borlase Matthews.

Greater Felcourt, East Grinstead, *May 2nd,* 1927.

The Ideal Wiring System.

Mr. H. R. Taunton, in Part 1 of his article in your current issue, rightly states that no wiring system can be safe unless properly fitted by a careful workman. With this I heartily agree, and I would add that the careful workman can best be evolved by apprenticeship with a registered contractor who is also a member of the E.C.A. or the E.C.A. of Scotland.

I observe that Mr. Taunton places h.g. screwed conduit at the top of his list, but says: "It is rare to meet an installation in which the logic of the system does not lapse at a wooden fuseboard or a ceiling block or the like." Surely he has been unfortunate in his district. Speaking from my experience all over Scotland, and Edinburgh in particular, it is the exception to come across any recent installation work done by qualified contractors on which iron boxes behind fuseboards and ceiling blocks are omitted.

There is no system for domestic work so lasting, safe, reliable, and so well adapted for extension or replacement of cables as a properly installed screwed-conduit installation. No other building item in the modern house gives such a useful return as the electrical installation if it is well fitted in the first instance, and the price of a reliable system is a small—too small—item in general building costs.

It is not the place of anyone interested in the welfare of the electrical industry to belittle the importance of a sound wiring job, and flexible surface systems for the most part should only be adopted as temporary expedients until the opportunity arises for fitting a concealed and continuous safe and lasting steel conduit system.

J. Johnston Foggo, N.R.E.I.C.

Edinburgh, *May 2nd,* 1927.

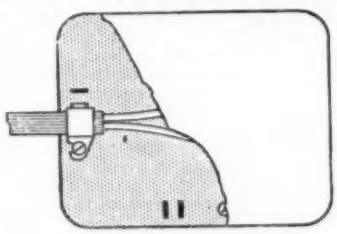
With reference to Mr. Taunton's article on "The Ideal Wiring System," he appears to consider that the cab-tire sheathed system most nearly approaches the ideal. He does not, however, mention one fault of this system, namely, that the rubber sheathing is apt to crack on the outside of bends after it has been in position for some time, as rubber *will* do when in tension. This fault is particularly noticeable in tropical climates, where great variations both in temperature and in dampness or otherwise of the atmosphere are experienced.

C. T.

May 7th, 1927.

Your contributor, Mr. H. R. Taunton, must have been particularly unfortunate in his choice of a lead-covered wiring system. He complains of the "complicated junction boxes, with elaborate clamps and terminals and a multiplicity of fiddling little screws."

From the illustration (line drawing enclosed) of the junction box included in the J. & P. wiring system fittings it will be seen that the bonding clip is the only loose part; the screws are *captive.* Should a wireman drop a clip, as feared by Mr. Taunton, it would be cheaper for him to take another from his pocket—they cost only about one-third of a penny



J. & P. Junction Box.

each—than to waste time getting down from a ladder to pick it up. To bond the sheathing of a cable firmly and permanently the tail of a clip is inserted in one of the slots in the back plate, the notched end is slipped over the cable and under the head of the captive screw, and the latter is tightened. No complexity, no elaborate clamps, no fiddling screws.

Mr. Taunton deplores the lack of a simple joint box for use with C.T.S. cable. We would refer him to our list C.T.S.W., where he will find particulars of a totally-enclosed universal joint box which is inexpensive, easily wired, and has no loose screws.

Johnson & Phillips, Ltd.

(CHARLES STEWART, *Director.*)

London, *May 7th,* 1927.

I have read Mr. Taunton's excellent article with considerable interest, as it confirms my opinion as regards C.T.S. which you published some years ago. My long experience, however, in the use of C.T.S. compels me to differ from him in the following points:—

(*a*) On page 710 he refers to cab-tire as being neither metal-sheathed *nor protected.* Cab-tire is well protected mechanically. It is astonishing what rough treatment it will stand during erection. Anyone who has used C.T.S. flexible in engine rooms and similar situations where it is subject to extremely rough treatment will appreciate this.

(*b*) On the same page he refers to potential danger through carelessness in stripping the sheathing, and states that such risk is greater with cab-tire than with lead-covered. Surely the reverse is the case, because of the close proximity to "earth" with lead-covered. This risk with C.T.S. is to my mind negligible.

(*c*) Further on he again refers to mechanical protection and the possible attack of nails, &c. This risk is certainly no greater than with lead-covered or light-gauge tubing. I have seen many a nail and screw driven through both lead-covered and conduit, with the result that the fuse usually blows and repairs are at once necessary. The wires cannot always then be drawn out of tubing as tube enthusiasts would have us believe.

Incidentally, a neat cement covering in chases is a much more effective protection than metal.

(*d*) As regards Mr. Taunton's statement as to cost, C.T.S. certainly costs less than lead-covered or tubing, because C.T.S. is more rapidly erected, and therefore the labour cost is less. Also, contractors can be certain of a high insulation test and need not allow for the possibility of paying the supply authority a fee for a second test, frequently necessary through moisture.

One can dismiss the remaining unimportant shortcomings —no wiring system is perfect—some risks must be taken, and after giving all the other systems a prolonged and thorough trial, not only for house wiring but for works wiring in the most difficult situations, I still prefer the small mechanical risks with C.T.S. to the much greater electrical and chemical risks of other systems.

C.T.S.

May 7th, 1927.

Off-Peak Supplies.

An article on "Electric Water Heating," in a recent issue of your journal by Mr. J. W. Meares, draws attention to some interesting possibilities of "selective" supplies.

The most effective method of controlling peak supplies, or of ensuring that certain supplies shall be "off-peak," is by means of the time switch, for this purpose not used here to the same extent as in certain foreign countries.

Mr. Meares perhaps attaches too much importance to the first cost of the time switch; the best appliances, of British make, are so satisfactory in action and have such low maintenance costs that their employment for supplies of any reasonable magnitude is easily possible.

The time has arrived when more attention should be given to storage methods; the possibility of storing electrical energy in the form of heat over long periods and with little loss is of immense value to the supply authority, allowing peak control without inconvenience to the user of the supply; moreover, it allows the time selection to take place at any period of the twenty-four hours, which is important, as it does not follow that the peak period will continue in the position on the clock which it generally occupies to-day.

The work already done in storage water heating and in warming rooms by heat accumulation, is sufficient to show how valuable this business can be in improving load factor. It would be worth while to revive interest in time-switch metering methods, in the "Dispensible" circuit proposals by Mr. Wilkinson, and even in methods of meter and switch control from a central source as carried out with the "Ripple" impulse appliances, to a limited extent already adopted for switching on and off street lighting.

Running motor appliances, as suggested by Mr. Meares, may be difficult to control, although it should not be beyond the capacity of the designer to produce a motor drive with speed to a great extent independent of pressure variation.

It may be too much to suggest "direct" switch control from a central point for all consumers; the distributing engineer will hardly welcome a proposal to run with every service a third wire for that purpose, but already in certain places the ordinary distributors carry a switch wire, permitting street lights and signs to be controlled from central points.

Some day perhaps electricity supply undertakings may be willing to provide a standard time service which could be linked in with peak control, or might even be able to work in conjunction with the telephone or radio service, those organisations, for a consideration, communicating to every one of their clients some periodic impulse adapted for operating meters or switch gear for the "selective" use of electrical energy.

We have not heard recently of "Wired Wireless," a proposal whereby central stations were to add to the attractions of their service a supply of music or news which could be picked up from any lighting installation; possibly the "Broadcasting" provisions of the world are too complete for anything of the kind to be attempted, but the existence of a "conductor" link between the power stations and each building in our cities and towns offers a tempting prospect to those inventors who study the more abstruse applications of electricity.

J. W. B.

May 2nd, 1927.

Bad Business Methods.

It may interest your readers to know exactly what goes on in the selling organisations for marketing certain domestic appliances. On April 28th we received an order for a Hoover sweeper for a new client. On April 28th we rang up the Hoover Co. and gave them the order over the telephone, and confirmed it the same evening, enclosing with our order a cheque in settlement. The machine was delivered on the 29th, and we invoiced our client on May 2nd. On May 6th we received a cheque from our client in settlement, and on the same morning, by first post, our client received an invoice from the electricity supply company, Edgware, for this same machine.

We do not know what impression our client now has of us, but we think possibly he may not trouble us again.

Jacob, White & Co., Ltd.

London, *May 6th*, 1927.

A Commutation Problem.

The letter in your issue of May 6th by Mr. A. O. Griffiths is of considerable interest. My opinion is that the solution lies, not in the design of the machine, but in a purely mechanical point.

It is noted that turning the commutator cures the trouble, whereas apparently no alteration in brush position, kind of brushes, or recessing the mica does so. Furthermore, the machine runs sparkless for a period of weeks after turning the commutator; clearly this eliminates all possibility of faulty design causing sparking.

On the other hand, it is noted that the speed is high. I suggest therefore that the trouble is in the design or assembly of the commutator, resulting in the possibility of one or more segments moving outwards slightly under centrifugal force, thus lifting the brush at each revolution.

When one realises that if a high bar gives the brush sufficient impetus to remain out of contact with the commutator for one hundredth of a second nine or ten bars will fail to establish direct contact with it at each revolution, it is not difficult to see that considerable arcing must inevitably take place.

The remedy is to put a wire band round the segments and re-turn the vees to fit the vee-rings accurately, then reassemble and tighten up hot, and finally, of course, skim up.

One other possibility, but a less likely one, is that in cutting down the micas a thin film is left adhering to adjacent segments at the commutator face. No doubt your correspondent is familiar with this pitfall. Perhaps he would like to communicate with me direct.

The Midland Electric Power Installation Co.

H. Joseph, *Proprietor.*

Wolverhampton, *May 9th*, 1927.

Legal.

Claim for Electricity Consumed.

In the Mayor's and City of London Court, recently, before Mr. Registrar Dell, a claim was made by Daniels Agency, 94, Cannon Street, inquiry agents, against Mr. J. Waterhouse, formerly trading as Waterhouse & Co., Tothill Street, S.W., for £2 15s. in respect of electrical energy used. Mr. H. Daniels, partner in the plaintiff firm, said when moving to their present offices in April last they received a bill from the electric light company, and they made a complaint. As a consequence of inquiries which were made, it was discovered that the defendant, who was the tenant occupying the floor below them, was using the same meter. He called upon the defendant several times, and afterwards came to an arrangement, after going into the figures, by which it was thought that £2 15s. was a fair amount to be paid by the defendant. He had promised to pay the amount, but had not done so. The defendant did not appear, and judgment was entered for the plaintiffs for the amount claimed, an order being made for payment on May 12th.

Impex Electrical, Ltd., v. Norton Wireless Co.

Mr. Justice Tomlin, in the Chancery Division, on May 4th, had before him an action by Impex Electrical, Ltd., of 538, High Road, Leytonstone, for an injunction restraining the alleged infringement by the Norton Wireless Co., 17, Norton Folgate, E.C., of their trade mark, "Dario," for wireless valves. The defendants denied infringement, and said they had never sold any valves bearing the word "Dario."

Mr. Courtney Terrell, for the plaintiff company, said that his clients dealt in various kinds of electrical apparatus, and especially in wireless valves. A French company, La Radiotechnique, supplied the plaintiff company with valves unmarked, and the trade mark "Dario" was attached to them by the plaintiff company. The latter was formed in 1925 by M. Auguste Fevre, who originally represented the French company in England. The valves supplied to the plaintiff company were made to a special specification, and they came from France in a carton worded in French. Last summer M. Fevre, hearing that defendants were applying his company's trade mark to their valves, sent a man, who saw in their shop window cartons similar to those containing the plaintiff company's "Dario" valves, and in the following October, after the defendants had been warned by letter, M. Fevre caused a purchase of a valve to be made. This bore the plaintiff company's trade mark. When an interim injunction was applied for, Mr. Thomas Kelly, of the defendant company, said it was true that a valve was sold to the plaintiff company's representative, but that the valve in question was not the one sold. The salesmen said not only was the valve not sold, but they never had in their possession valves marked "Dario," nor had they any cartons bearing French words. Evidence was called to prove the purchase of the alleged infringing valve.

For the defence, Mr. THOMAS KELLY, the principal member of the defendant firm, said he had never had any cartons in the shop bearing French wording, nor had he seen the plaintiff company's valve until it was produced in court. Mr. MELVILLE, K.C., for the defendants, said the utmost that could be proved against them was that they sold one article in regard to which there might be a complaint, and he asked his Lordship to hold that there was no threat to infringe the plaintiff company's rights. While there was an innocent offence, there was no case for the granting of an injunction.

Mr. Terrell did not proceed with his final speech, but asked that Mr. Kelly be recalled for further cross-examination in view of certain information that had just come into the possession of the plaintiff company.

The case was adjourned until a time to be fixed for further cross-examination and, if necessary, further evidence.

Bosville v. Wood.

HENRY WOOD, motor engineer, Leyburn, was sued at York County Court, recently, for £43, for alleged defective electric wiring, the plaintiff being Thomas Bosville, Leyburn. According to the evidence the defendant was engaged to re-wire the house, plaintiff thinking he was a qualified electrical engineer, and he was paid £175 for the work. Examination by an expert revealed many defects and he refused to pass the house for insurance as the wiring was unsafe. The defence was that there was no contract for Wood to do the work, and that what he did was according to Mr. Bosville's instructions. The Judge remarked that a good many of the mysterious fires which had occurred were probably due to causes such as had been revealed in that case. He gave judgment for plaintiff for the full amount claimed with costs.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1925.

28,333. "Tel-vision and apparatus for use in transmitting views, scenes, images, pictures, and other objects of an animated or inanimated nature to a distance." J. L. Baird. October 21st, 1925. (260,219.)

28,284. "Receiving apparatus for wireless telegraphy and telephony." G. B. Ellis (Sachsenwerk Licht-und Kraft Akt. Ges.). September 2nd, 1926. (Convention date not granted.) (2,5,013.)

31,678. "Dry cells, and method of producing same." Twin Dry Cell Battery Co. December 15th, 1924. (244,494.)

31,710. "Means for improving the factor in alternating-current circuits." G. Bauer. December 15th, 1925. (260,225.)

31,932. "Manufacture of electrical resistances." Morgan Crucible Co., Ltd., and C. C. Gow. December 17th, 1925. (260,227.)

1926.

111. "Means for testing electric incandescent lamps." A. Kelly. January 2nd, 1926. (260,231.)

436. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd., and R. Taylor. January 6th, 1926. (260,233.)

457. "Automatic and semi-automatic telephone systems." Standard Telephones & Cables, Ltd. (G. Deakin). January 7th, 1926. (260,236.)

1,007. "Electrically-driven cranes." British Thomson-Houston Co., Ltd., and C. J. H. Trutch. January 13th, 1926. (260,245.)

1,113. "Thermionic valves for wireless telegraphy and telephony." J. K. im Thurn and H. Morris-Airey. January 14th, 1926. (260,250.)

1,146. "Modulated carrier-wave signalling systems." Standard Telephones and Cables, Ltd. (Western Electric Co. Inc.). January 14th, 1926. (260,251.)

1,240. "Contact banks for telephone switches." Standard Telephones and Cables, Ltd., M. S. Snell, and R. St. G. Terry. January 15th, 1926. (260,257.)

1,241. "System for producing electrical oscillations." Standard Telephones and Cables, Ltd. (Western Electric Co. Inc.). January 15th, 1926. (260,258.)

1,299. "Electric measuring instruments." British Thomson-Houston Co., Ltd., R. C. Clinker, and L. J. Clark. January 16th, 1926. (Addition to 175,052.) (260,259.)

2,130. "Inductance coils." E. E. Rooke. January 25th, 1926. (260,266.)

3,545. "Adjustment means for wireless receiving apparatus." L. Q. Slocumb. March 27th, 1925. (249,824.)

5,027. "Switchboards for motor vehicles and the like." British Thomson-Houston Co., Ltd., A. G. Salisbury, and T. H. Wood-Field. February 22nd, 1926. (260,285.)

5,700. "Wireless receiving apparatus." J. J. Dowling and D. O. T. McAteer. March 1st, 1926. (260,291.)

6,285. "Electric rectifiers and transformers." M. H. Goldstone and H. O. Farrell. March 6th, 1926. (260,296.)

6,328. "Electrolytic refining of copper." Siemens & Halske Akt. Ges. January 6th, 1926. (264,116.)

7,818. "Electric switches." J. B. Tucker. March 22nd, 1926. (260,309.)

8,280. "Magneto ignition systems." British Thomson Houston Co., Ltd., A. P. Young, and E. G. Parrott. March 26th, 1926. (260,313.)

8,291. "Electric ignition systems." British Thomson-Houston Co., Ltd., and L. Griffiths. March 26th, 1926. (260,314.)

9,565. "Three-phase wired carrier-wave receiving circuits." Wired Radio Inc. June 5th, 1925. (253,079.)

9,751. "Electric ignition systems." British Thomson-Houston Co., Ltd. and A. P. Young. April 13th, 1926. (260,327.)

10,805. "Electric wiring system fittings." J. C. White. April 24th, 1926. (260,338.)

11,391. "Manufacture of oxide cathodes for discharge tubes." H. Wade (Naamloze Vennootschap Philips' Gloeilampenfabrieken). April 30th, 1926. (260,341.)

11,713. "Motor control systems using time-lag electroresponsive devices." British Thomson-Houston Co., Ltd. May 4th, 1925. (251,671.)

12,337. "Four-wheeled tramcar side-frames and the location of springs on same." C. Lewis. May 13th, 1926. (260,347.)

12,960. "Wireless receiving apparatus." J. W. Galloway. May 20th, 1926. (260,349.)

13,960. "Electric switches." International General Electric Co. Inc. June 9th, 1925. (253,512.)

14,009. "Space-discharge tube systems having variable condensers." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). June 3rd, 1926. (260,355.)

17,226. "Device for indicating the correct working of sparking-plugs and magnetos of explosion motors." J. Barnett, jun., and E. Salisbury. July 9th, 1926. (260,370.)

17,233. "High frequency induction heating apparatus." British Thomson-Houston Co., Ltd. (General Electric Co.). July 9th, 1926. (260,371.)

17,572. "Ignition magnetos for internal-combustion engines." M. M. Cardellino. July 13th, 1926. (260,374.)

18,504. "Electrolytic cells." Automatic Telephone Manufacturing Co., Ltd., and R. W. Tarrant. July 24th, 1926. (260,378.)

18,865. "Secondary electric batteries." Hart Accumulator Co., Ltd., and C. R. Hardy. July 28th, 1926. (260,380.)

20,387. "Device for electrically coupling two or more electric motors." A. Blondel and G. T. Guy. August 18th, 1926. (260,386.)

20,740. "Mountings for thermionic valves or the like." E. H. Fleming. August 23rd, 1926. (260,388.)

21,527. "Electric contact apparatus, more particularly for railway signalling purposes." Siemens & General Electric Railway Signal Co., Ltd., F. Downes and W. D. Rogers. September 1st, 1926. (260,391.)

21,548. "Selective relays for the protection of electric distribution systems." Compagnie pour la Fabrication des Compteurs et Materiel d'Usines à Gaz. September 19th, 1925. (258,570.)

24,057. "Electric safety fuses." E Maurich. October 8th, 1925. (259,556.)

24,093. "Electrical tube-welding devices." P. Godien and K. Schwade. September 29th, 1926. (260,402.)

24,186. "Wireless telegraphy and telephony." Telefunken Ges. für Drahtlose Telegraphie. October 1st, 1925. (259,236.)

24,575. "Electric hand lamps." E. C. R. Marks (National Carbon Co. Inc.). October 4th, 1926. (260,405.)

25,078. "Electric advertising devices." O. Wawra August 3rd, 1926. (260,410.)

25,200. High-frequency amplification system." Hazeltine Corporation. October 10th. 1925. (259,613.)

25,528. "Accumulators." Dr. E. Selg. October 22nd, 1925. (260,244.)

25,723. "Methods of and apparatus for electroplating." British Thomson-Houston Co., Ltd. October 15th, 1925. (259,983.)

26,075. "Ignition apparatus for internal-combustion engines." International General Electric Co. Inc. October 20th, 1925. (260,258.)

27,120. "Electric incandescent lamps for projection purposes." British Thomson-Houston Co., Ltd. October 29th, 1925. (260,615.)

27,731. "Quick-action rotary electric switches." Therma Fabrik fur Electrische Heizung Akt. Ges. vorm. S. Blumer. March 30th, 1926. (268,734.)

27,732. "Barrel electric switches." Therma Fabrik fur Electrische Heizung Akt. Ges. vorm. S. Blumer. March 31st, 1926. (268,725.)

27,805. "Multiple-filament electric lamps." British Thomson-Houston Co., Ltd. November 5th, 1925. (261,020.)

27,852. "Headlights, specially for motor-driven vehicles." F. Singer and Fenag Akt. Ges. November 5th, 1926. (269,422.)

28,790. "Cone-type loud speaker." Hopkins Corporation. June 1st, 1925. Divided application on 252,685.) (261,426.)

30,279. "Sparking plugs." P. D. Peterson and H. T. Tillquist. April 26th, 1926. (269,093.)

30,427. "Electrical distribution systems." British Thomson-Houston Co., Ltd. December 1st, 1925. (262,431.)

31,147. "Incandescent electric lamps." British Thomson-Houston Co., Ltd. December 8th, 1925. (262,788.)

31,469. "Electric condensers." British Thomson-Houston Co., Ltd. July 19th, 1926. (269,101.)

32,646. "Electric arc lamp for photographing." H. Traut, Munchen Ges. December 28th, 1925. (263,823.)

1927.

767. "System for the protection of electrical installations against excessive voltages." G. Campos. January 8th, 1926. (264,187.)

1,102. "Spark plugs." British Thomson-Houston Co., Ltd. January 14th, 1926. (264,518.)

1,418. "Accumulators." Dr. F. Aletter and Dr. L. Strasser. January 16th, 1926. (264,539.)

1,486. "Rods or tubes of insulating material, more particularly for suspension or strain insulators." International General Electric Co. Inc. January 18th, 1926. (264,540.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 4th :—

Jupiter. No. 475,348. Class 8. Electric lamps for projection purposes.—Juperlicht Gesellschaft Kersten Brasch, Berlin. (British representatives: Chatwin & Co., 253, Gray's Inn Road, W.C.1.)

P.P.P.P. (lettering and design). No. 476,900. Class 8. Radio-telephonic sets, telephone instruments, and electrical control apparatus.—Plessey Co. (1925), Ltd , Vicarage Lane, Ilford.

R. & B. (lettering and design). No. 477,928. Class 8. Philosophical and scientific instruments and apparatus for useful purposes.—Reynolds & Branson, Ltd., 13, Briggate, Leeds.

Britex. No. 478,150. All goods in Class 8.—C. S. Pyser, 50, Bank Chambers, 329, High Holborn, W.C.1.

Noctovisor. No. 478,271. Class 8. Apparatus for use in transmitting views, scenes, or images to a distance by telegraphy.—Television Ltd., Motograph House, Upper St. Martin's Lane, W.C.2.

Inadequate Distribution Mains.

In a letter recently sent to the Incorporated Municipal Electrical Association and the Provincial Electrical Supply Committee of the United Kingdom, the Electricity Commissioners urged authorised supply undertakers to adopt the policy of anticipating the future demands on their mains by the provision of distributors of adequate section. The Commissioners have noted that the practice prevails in some cases of laying distributors of so small a sectional area as to tend to restrict or preclude the use of such distributors for dealing with any development of the domestic load. It has also been observed in a number of cases that the cost of excavation, reinstatement and jointing has exceeded the cost of the cable itself; and that by a comparatively small additional expenditure on cable of a larger size provision could have been made for dealing with a load at least twice as great as that possible with the cable actually laid. It is suggested that, except in special cases, distributors having a cross section of not less than 0.05 sq. in. should, as a general rule, be provided.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

AUDENSHAW.—Adaptation of Westernlea as clinic; Lancashire Education Committee.

AYR.—Alterations to Mansion House (electric lighting) for Corporation; burgh surveyor.

BASFORD.—Secondary school for Notts Education Committee; H. James, Mansfield.

BIDDULPH (STAFFS.).—Additional 50 houses, for the U.D.C.; Mr. Gibson, surveyor.

BILSTHORPE.—Elementary school for Notts Education Committee; Greenwoods (Mansfield), Ltd.

BIRKENHEAD.—Fire station and firemen's houses, for the T.C.; Charles Brownridge, borough engineer.

BIRMINGHAM.—Elementary school, Billesley; Education Committee.

BOLTON.—Extensions, Dove Mill, Deane Church Lane; Dove Spinning Co. Pattern stores, Bark Street; Ryder Bros. Conversion of school in Fern Street to cinema; F. Moorhouse. Alterations cinema, Rumworth; Bolton Cinema Co. Bank, Derby Street; Manchester and County Bank, Ltd.

BRAINTREE.—Housing scheme (56), for the U.D.C. Ward block, &c., Cressing Road hospital, for the Joint Hospital Board; D. G. Armstrong, architect, Great Square.

BROWNHILLS (STAFFS.).—Houses (54), for the U.D.C.; J. W. Edwards, builder, Birmingham.

BULKINGTON.—Cinema, Rieton, for Frank Voce, Nuneaton.

CLOWNE (DERBYSHIRE).—Additional 50 houses, for the R.D.C.; surveyor.

COATBRIDGE.—Re-erection of premises, Main Street, for D. M. Stark, Ltd. (£3,500).

COVENTRY.—School (1,250 places), Radford, for the borough E.C.; director of education.

DARTMOUTH.—100 houses for the T.C.; borough surveyor.

DARTON.—Ex-Service men's club, Station Road; W. Wrigley, architect, 2, King Street, Wakefield.

DUNBAR.—Additions to secondary school (£6,812); clerk School Management Committee.

DUNCHURCH.—School (£8,000), for Warwickshire E.C.; director of education, Warwick.

DUNDEE.—School at Lochee; Bishop Toner. Maternity hospital for directors of Royal Infirmary; the secretary.

EASINGTON (Co. DURHAM).—Additional 50 houses, for the R.D.C.; surveyor.

EASTBOURNE.—Masters' quarters, &c., Eastbourne College; Tatchell & Wilson, architects.

EAST GRINSTEAD.—Offices (£6,258), for the U.D.C.; J. Bodle, builder.

EDINBURGH.—Reconstruction of Empire Palace Theatre; manager, Moss Empires, Ltd.

EXETER.—Joint mental institution; City Council and Devon and Cornwall County Councils.

GLOSSOP.—Works, J. Hadfield & Sons, Derby Street.

GRANTHAM.—Rebuilding church schools, for the managers; Messrs. Parks, builders.

HARLESCOTT.—School, for Salop E.C.; director of education, Shrewsbury.

HEANOR.—Clinic, for Derbyshire E.C.; G. H. Widdows, education architect, St. Mary's Gate, Derby.

HERTFORD.—Hospital extensions, for the Joint Hospital Board (£3,000); G. H. Gisby, clerk.

HUDDERSFIELD.—Roman Catholic schools (£6,000); Joseph Berry & Sons, architects, Market Place; James Horkin and Son, builders, Liversedge.

HULL.—Extensions, Royal Infirmary (£150,000); governors.

KIRKBY-IN-ASHFIELD.—Sewage scheme (£19,000); U.D.C. surveyor.

KIRKINTILLOCH.—Baptist church; Rev. Jas. Scott.

LEEDS.—Extensions, Meanwood mental colony; J. Kirkland, architect of the Board of Control. Corporation assessor.

LEWIS.—Sanatorium extensions (£13,180), for Ross and Cromarty C.C.; the clerk, Dingwall.

LLANBISTER.—School, for Radnorshire E.C.; T. W. Wishlade, county surveyor, Llandrindod Wells.

LONDON (ILFORD, E.).—104 houses, Lonsdale Gardens, &c.; Suburban Developments, Ltd. School, Benton Road (£5,721), for the borough E.C.; the clerk. Extensions to Roman Catholic schools, High Road, for the managers; P. Palmer, correspondent.

(ST. MARYLEBONE, N.W.).—Blocks of flats, Carlisle Street area; Ashley & Newman, architects for Borough Council. Flats, Abbey Lodge estate, Park Road; J. Murray.

(GREENWICH, S.E.).—Nurses' quarters, &c., for the B.G.; A. Roberts, architect, 92, London Street, S.E.

(S.W.).—Re-wiring Southern Hospital; Metropolitan Asylums Board.

MAIDSTONE.—Offices, King Street, for the B.G.; the clerk. Offices, Palace Avenue, for the T.C. (£3,000); borough surveyor.

MANCHESTER.—Houses for staff, Partington gasworks; city engineer. School, Dover Street; managers, Holy Name Roman Catholic School.

MANSFIELD.—Technical college for Notts Education Committee; Greenwoods (Mansfield), Ltd.

MIDDLESEX.—Bath Road widening (£145,000); county engineer.

MIDDLETON (LANCS.).—Electric light installation, Rhodes School, for the borough E.C.; the clerk.

NEWCASTLE.—29 houses, White Brickfield estate, for Corporation; J. S. Hetherington.

NORMANTON.—School, for Derbyshire E.C.; H. W. Skinner, clerk, County Offices, Derby.

NORTHAMPTON.—Hall, Brunswick Street (£8,000), for the Salvation Army.

NORTHCHURCH.—Offices, High Street; Berkhampstead R.D.C. surveyor.

NOTTINGHAM.—Office extensions, St. Mary's Gate; county surveyor.

OXFORD.—Library extensions; city engineer.

POOLSBROOK (STAVELEY).—School (300 places), for Derbyshire E.C.; H. W. Skinner, clerk, County Offices, Derby.

PURLEY (SURREY).—Additional 50 houses, Coulsdon, for the U.D.C.; surveyor.

RETFORD.—Theatre, Coronation Street; C. Getliffe. Cinema, Regent Picture Palace Co.

SEAHAM (Co. DURHAM).—Houses (100), for the Londonderry Collieries, Ltd.

SHEFFIELD.—Church, Manor estate; trustees, Roman Catholic Diocese of Leeds. Adaptation of Redmires Camp as infectious diseases hospital; medical officer of health. Sewage plant (£53,000), for the Corporation; city engineer. 172 houses, Ridgway estate; city architect.

SHOTTON.—Central school (450 places), for Flintshire E.C.; J. Bevan Edwards, secretary, Flint.

SCHOOL AYCLIFFE.—Mental colony, Durham County Council.

SMETHWICK.—64 houses, Alexander Road, for Corporation; G. Stubbings, Birmingham. Church, Church Lane, Spiritualist Community. Extensions, Soho Foundry; W. & T. Avery, Ltd. Extensions, North Works Foundry; Midland Motor Cylinder Co., Ltd.

STOKE-ON-TRENT.—Additional housing schemes (3,056), for the T.C.; A. Burton, city surveyor.

TRANENT.—School (£15,474); clerk, School Management Committee.

TWICKENHAM.—Shops, workshops and 47 garages, Richmond Road; Brewer, Smith & Brewer, architects, Richmond-on-Thames.

UPMINSTER (ESSEX).—Extensions, St. Laurence Church (£8,000); Sir Charles Nicholson, architect.

WEST STANLEY.—Training centre, for Durham County E.C.; education architect, Durham.

WHIXLEY.—Extensions, mental institution; Mid-Yorkshire Joint Board.

WINNINGTON (CHESHIRE).—Electric light installation, St. Helen's Church, Witton; Rev. A. W. M. Wood, M.A., vicar.

WINTERTON.—Infirmary; Durham county architect.

WORTHING.—Extensions, Christ Church (£4,322); Sandell and Sons, builders.

YORK.—Handicraft and science centre, Knavesmire School; Education Committee. Conversion old library, Clifford Street, into technical school; Education Committee. Elementary school, Tang Hall; William Bellerby, Ltd.